HORTICULTURAL ABSTRACTS

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EDITORIAL NOTES

TRANSFER OF TOBACCO ABSTRACTS TO FIELD CROP ABSTRACTS

This is the last number of *H.A.* in which abstracts on Tobacco will appear. As from the beginning of 1966 this important crop will be included in *Field Crop Abstracts*, prepared by the Bureau of Pastures and Field Crops at Hurley.

Any subscriber who has already paid his subscription to *H.A.* for 1966 and who is interested primarily in Tobacco may transfer this subscription to *F.C.A.* by notifying Commonwealth Agricultural Bureaux, Central Sales Branch, Farnham House, Farnham Royal, Bucks, England. But to avoid any confusion please do this as soon as possible.

INDEXES

No Annual Author and Subject Indexes are being issued for the present volume of *H.A.* Instead, the indexes to this volume will form part of another Cumulative Index covering Vols 31 to 35 which is due to be issued during the first half of 1966.

ONE-SIDE-ONLY H.A.

Readers who wish to prepare their own card indexes are reminded that copies of *H.A.* can be obtained printed on one side only, but the supply of o-s-o copies is limited and orders for Vol. 36 should therefore be sent to C.A.B., Central Sales Branch, without delay. The extra cost is only 25 shillings per volume and apart from that all the reader needs is patience, a sharp pair of scissors, a large number of cards and a copious supply of glue.

NEW PUBLICATIONS

Leaflets describing two new books are enclosed in this number, but as these leaflets may well be extracted or fall out before the number has completed its rounds, it may be helpful to mention that brief details of these and other publications are given on the back cover. The books in question are a fully revised and much enlarged edition of *Technical Communication* No. 22 "Sand and water culture methods used in the study of plant nutrition", by E. J. Hewitt, and *Research Review* No. 1, "Specific replant diseases", by B. M. Savory.

GENERAL ASPECTS OF RESEARCH AND ITS APPLICATION.

Miscellany.

6847. KÁROLYI MIHÁLY ORSZÁGOS MEZŐGAZDASÁGI KÖNYVTÁR ÉS DOKUMENTÁCIÓS KÖZPONT. (MIKÓ, A., DIRECTOR.)
15 Év a mezőgazdaság szolgálatában: az OMgK tevékenysége. Cikkgyüjtemény. **(15 Years in the service of agriculture: the activity of the National Agricultural Library. Collection of papers.)** [English, Russian and German summaries.] *Közlem. Károlyi M. orsz. mezogazd. Könyvtár és Dokum. Közp.* 7, 1964, pp. 208.

In this collection of 11 papers the activity and history of the institute and of its translation service are reviewed.

6848. KALINKE, H.
Methoden und Ergebnisse arbeitswirtschaftlicher Untersuchungen und ihre Folgerungen für die Betriebsführung. **(Methods and results of economic investigations and the conclusions relevant to farm management.)** *Schweiz. Gärtnerztg*, 1965, **68**: 42-6, bibl. 6.

Methods are described for the detailed assessment of daily direct and indirect labour requirements in horticulture, permitting a comparison between holdings of different size.

6849. WRIGHT, W. J.
Horticultural management. *N.A.A.S.quart. Rev.*, 1965, No. 68, pp. 173-7.

The maintenance of cropping records, by means of a specially designed horticultural business record book, and the planning of a forward budget, are discussed.

6850. SOARES, F. A.
Nomes vernáculos chineses de algumas plantas de Macau. **(Chinese names of some plants of Macau.)** [English summary 9 lines.] *Garcia de Orta*, 1963, **11**: 573-91, [received 1965].

Chinese, scientific and Portuguese names of 250 species, including vegetables, ornamentals, and condiment, drug, fibre, spice and plantation crops.

Seeds.

(*See also* 7362, 7372, 7791, 7992, 8024, 8025, 8158, 8192, 8326, 8327, 8476, 8516.)

6851. MANOHAR, M. S., AND HEYDECKER, W.
Water requirements for seed germination. *Rep. School Agric. Univ. Nottingham, 1964*, 1965, pp. 55-62, bibl. 5.

Pea seeds were germinated at 25° C. (a) on tension plates enclosed in polythene bags and (b) in petri dishes on 2 layers of filter paper moistened with 25 ml. of distilled water or mannitol solution (−15 atm.). The micropyles of the seeds faced upwards away from the source of moisture; those of half the seeds in each treatment were closed with vaseline. With distilled water as the source of moisture, micropyle closure did not affect germination; however, germination was considerably delayed when the area of seed coat in contact with water was restricted, as in the tension plates. Seeds with open micropyles in mannitol at −15 atm. germinated more rapidly than seeds with open or closed micropyles in a reduced amount of water at −0·1 atm. The germination of seeds with sealed micropyles was almost completely suppressed in mannitol solution. In a further experiment various solutes with molecules of different sizes were compared as osmotic agents. Pea seeds were placed in petri dishes containing solutions of NaCl, glycerol, mannitol and 3 polyethylene glycols with high molecular weights, each at potentials of 0, −5, −10 and −15 atm. NaCl proved toxic; germination in glycerol at all potentials was similar to that in water. Mannitol slightly delayed, but did not depress, germination. Seeds germinated rapidly in the polyethylene glycols at −5 atm., but no germination occurred at a lower potential; these glycols appeared to possess truly osmotic properties and were non-toxic to the seeds. A formula is presented to express the water uptake by seeds. [For earlier work see *H.A.*, 34: 4795.]

6852. KÜHNE, L., AND KAUSCH, W.
Die Aktivierungsenergie der Samenquellung. **(The energy of activation of seed swelling.)** *Naturwissenschaften*, 1965, **52**: 309-10, bibl. 7.

Earlier work established that seed swelling occurs as a result of diffusion, which is a molecular migration and requires energy of activation. Equations are presented for the calculation of this energy, and figures are given for seeds of peas and other plants.—Inst. landw. Bot., Univ. Bonn.

6853. RADECKE, H.-R.
Beiträge zur Entwicklungsphysiologie und Biochemie der Samen. 1. Mitteilung: Säurestoffwechsel. **(Contributions to the developmental physiology and biochemistry of seeds. Part 1: Acid metabolism.)** *Pharmazie*, 1965, **20**: 1-11, bibl. 103.

A review of work on the carboxylation and decarboxylation processes and on changes in acid content during the ripening and germination of seeds.

6854. NUŽDIN, N. I., AND OTHERS.
The effect of space flight factors on the seeds of *Euonymus europaea*. [Russian, with English summary ¼ p.] *Izv. Akad. Nauk SSSR, Ser. biol.*, 1965, No. 4, pp. 576-80, bibl. 19.

Seed irradiation with γ-rays and space flight had an additive effect on the frequency of chromosome aberrations in root tips.

Propagation.

(*See also* 7467, 8029.)

6855. FIORINO, P.
La propagazione per talea con la nebulizzazione. **(Mist propagation of cuttings.)** *Inf. Ortofloro-fruttic.*,* 1965, **6**: 139-42, illus.

Installations, control systems, rooting media and growth substance treatments are described.

6856. FOLLMANN, G.
Flechtenstoffe und Stecklingsbewurzelung. **(Lichen substances and the rooting of cuttings.)** *Naturwissenschaften*, 1965, **52**: 266, bibl. 4, illus.

Four growth-inhibiting substances derived from lichens all strongly inhibited the rooting of stem cuttings of the normally free-rooting *Abutilon striatum*, *Hedera helix* and *Salix blanda*. [See also *H.A.*, 34: 17.]—Univ. Chile, Santiago.

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* Formerly *Inf. Ortofruttic.*

Climate and air pollution.

(*See also* 7644, 8204, 8332, 8421-8423.)

6857. Rotrekl, B.
Herstellung von landwirtschaftlichen Rauchbildnern aus Abfallprodukten der chemischen Industrie. **(The production of agricultural smoke generators from waste products of the chemical industry.)** *NachrBl. dtsch. PflSchDienst, Berlin*, 1965, **19**: 18-19, bibl. 4, illus.

The production of smoke generators, suitable for frost protection, from residues of 2-naphthol distillation, ammonium chloride, wood shavings and nitrates of sodium and potassium is described. Neither the smoke nor the residual ash is phytotoxic.

6858. Berge, H.
Immissionen und ihre Auswirkungen auf Freiland- und Unterglaskulturen. **(Air pollutants and their effects on outdoor and glasshouse crops.)** [English and French summaries 6 lines each.] *Gartenbauwiss.*, 1965, **30**: 63-8, bibl. 4.

Emanations from natural or industrial sources are classified into groups according to the type of damage caused; it is pointed out that the same emanation may belong to different groups, depending on the plant species or environment under consideration. Glasshouse crops were more protected than outdoor crops from smoke and fog, but less from gas and steam. Sulphur dioxide and short-term fluorine emanations caused more damage outdoors, but long-term fluorine and chlorine emanations caused more damage in humid houses. It is concluded that no generalized assessment of effects is possible, and that official permissible levels may have little value outside a given area. [See also *H.A.*, 34: 6051.]—AgrikultChem. Inst., Heiligenhaus.

6859. Treshow, M., and Transtrum, L. G.
Similarity between leaf markings caused by air pollutants and other agents: I. Moisture stress and fluoride expression. *Proc. Utah Acad. Sci.*, 1964, **41**: 49-52, bibl. 3.

The occurrence and nature of moisture stress and fluoride toxicity injuries are compared, and methods of distinguishing between them discussed.

Soil management and irrigation.

(*See also* 6982, 8226.)

6860. Ragaller, F.
Über die pflanzenbaulichen Voraussetzungen einer Kultivierung von Abfallkalkteichen aus der Sodafabrikation. **(Preparation of the waste lime basins of a soda factory for crop cultivation.)** [Russian and English summaries ⅓ p. each.] *Albrecht-Thaer-Arch.*, 1965, **9**: 585-600, illus.

The upper layers of the basins were worked and loosened to a depth of about 25 cm., and a cover of soil about 25 cm. thick was applied, followed by deep ploughing to mix the 2 layers. Before planting the basins P_2O_5 at 150 kg./ha. was applied. Crops grown included carrots, dwarf beans, broad beans, safflower and poppies.—Inst. PflZücht., Bernburg.

6861. Heyna, B. J.
Beter grondstomen. **(Better soil steaming.)** *Groent. en Fruit*, 1965, **20**: 1345-6, illus.

The method and effects of balloon-sheet steaming are discussed. The results were as good as with plough-steaming but not as efficient as with pipe steaming. In a fairly heavy soil the temperature at a depth of 30 cm. reached 100° C., but at 40 cm. it reached only 60°. The steam itself did not penetrate deeper than 30 cm., and rapid condensation to hot water took place under the sheet. Consequently steam penetration became slower as the soil became wetter and less porous, particularly in the upper 10 cm. [For related work see *H.A.*, 34: 250.]—Inst. TuinbTech., Wageningen.

6862. Nevskij, S. P.
The water requirements of plants in relation to meteorological conditions. [Russian.] *Vestn. sel'sk. Nauki*, 1965, **10**(2): 129-34.

Formulae are suggested for the determination of optimum irrigation rates, based on data obtained over a period of years from 80 irrigation trials on a number of crops including apples and vines.

6863. Hyrycz, K. J.
Plastic irrigation equipment. *Gdnrs' Chron.*, 1965, **158**: 105, illus.

Another account of the equipment developed at East Malling Research Station [see *H.A.*, 35: 4831].

6864. Ministry of Agriculture, London.
Watering equipment for crops under glass. Capillary watering of plants in containers. *Hort. Mach. Minist. Agric., Lond.*, **9**, 1964, pp. 6, illus.; and **10**, 1964, pp. 5, illus.

The first pamphlet deals with the estimation of water requirement, various types of overhead and low-level irrigation systems for plants in borders and beds, ancillary equipment and automatic control of the systems. The second describes several methods of watering pot plants on benches.

6865. Winter, E. J., and Cook, R. D.
Automatic watering in glasshouses. *Grower*, 1965, **63**: 1290-1, bibl. 1, illus.

An adaptation of the bench method [see *H.A.*, 32: 4196] is discussed. The sand-filled bench is lined with polythene, water being supplied *via* a ball valve. The containers are placed on the surface of the sand rather than plunged into it. The compost in the containers remains at field capacity, and vegetative growth appears to be faster and softer than with orthodox watering. The system proved suitable for a wide range of plants and types of plant container.—Nat. Veg. Res. Stat., Wellesbourne, Warwick.

6866. Westley, C. B.
Low cost pot plants in unheated glass. *Brit. Fmr*, 1965, No. 396, pp. 50-1, illus.

Work at Luddington is described, including the development of a simple, cheap form of irrigated bench. Polythene forms the base, upon which a 1-inch layer of sand is spread. Water is applied to the surface through a perforated lay-flat plastic tube. Liquid feeding is carried out through a dilutor, and the spread of nutrients through the sand has been satisfactory.

6867. Aljibury, F. K., Tomlinson, W. M., and Houston, C. E.
Irrigation for nursery container plants. Tensiometers, automatic timing for sprinkler control. *Calif. Agric.*, 1965, **19**(5): 2-4, illus.

Ornamentals in 1-gallon containers were irrigated by hand watering, manually operated sprinklers and automatic sprinklers. Both sprinkler systems were more efficient than the drag hose. The automatic system (using tensiometers and automatic timing) resulted in reduced labour and water costs.

6868. Stice, N. W., and Booher, L. J.
Plastic tube irrigators with electric control. *Calif. Agric.*, 1965, **19**(5): 4-5, illus.

Large container-grown plants were irrigated and fertilized by using 9 plastic tubes ⅛ in. in diameter radiating from a central riser. Each master unit of the system was operated by a clock-controlled 3-in. valve and was capable of irrigating 720 containers simultaneously in 5 minutes. The system could serve 12,000 containers, requiring 1½ hours to irrigate them compared with 150 man-hours for hand watering.

Nutrition and salinity.

(*See also* 7662, 7663, 8668.)

6869. Saakov, V. S.
The influence of boron and manganese on the dynamics of the translocation and distribution of C^{14} glucose in the plant. [Russian.] *Doklady Akad. Nauk SSSR*, 1965, **162**: 465-7, bibl. 6.

Radioactive glucose was introduced through the petioles into bean plants in solution culture grown for 12-15 days with and without B or B+Mn. The rate of translocation of C^{14} glucose to the reproductive organs was higher in plants grown with B, and particularly with B+Mn, than in the controls. The B-treated plants also showed a higher rate of movement of the radioactive glucose to the root system and young growing organs. A maximum amount of radioactivity was found in the plants 6 hours after the introduction of glucose. During the evening and night time there was a considerable reduction in the radioactive content of the plant. An increase in radioactivity occurred, however, 24 hours after treatment, as a result of the increasing intensity of photosynthesis during daylight, At this time the roots of plants grown with B+Mn contained 12 times as much radioactive glucose as those of the controls.

6870. Van Steveninck, R. F. M.
The significance of calcium on the apparent permeability of cell membranes and the effects of substitution with other divalent ions. *Physiol. Plant.*, 1965, **18**: 54-69, bibl. 34.

Beetroot storage tissue developed leaky membranes when exposed to EDTA solutions of low concentration but with a sufficient number of chelating molecules to remove 69–76% of the total Ca^{2+} present in the tissue. The phenomenon was characteristic of an all-or-none reaction, which was completely and immediately reversed through the addition of Ca^{2+}. The effect was specific to Ca^{2+}; although Sr^{2+} and Mn^{2+} could take the place of Ca^{2+}, they did so less efficiently. The possible role of other divalent ions such as Mg^{2+}, Fe^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Zn^{2+}, Ba^{2+}, Cu^{2+} and Cd^{2+} was investigated, and the importance of the relative magnitude of the stability constants of their EDTA complexes and the corresponding tissue component-metal complexes is discussed. An attempt was made to study the distribution of Ca^{2+} and Mg^{2+} and added divalent ions between the protoplasmic fraction and the cell wall fraction. Ca^{2+}, Ba^{2+} and Sr^{2+} mainly followed a 50/50 distribution, and it was concluded that these elements were mainly associated with the cell surface, i.e. outer protoplasmic surface and cell wall. It is suggested that Ca^{2+} plays an important role in bonding negative charges of the plasma surface and cell wall respectively. All other divalent ions were predominantly associated with the protoplasmic phase. Results indicated that unspecific effects of divalent cations on the colloid chemical behaviour of the protoplast are of importance only when Ca^{2+} is absent, or when conditions of extreme unbalance are induced through the removal of a large proportion of divalent ions from the tissue. [Author's summary.]—D.S.I.R., Lincoln, N.Z.

6871. Lavagetto, F., and McNeil, A. L.
Cost of producing CO$_2$ dependent on two factors. Reprint from *Flor. Rev.*, 1965, **136**(3519): 47-8, 103-6.

Tables are presented showing the cost of CO$_2$ when produced from propane and from natural gas, and different types of gas burner are described for use in glasshouses to provide both heat and CO$_2$.

6872. Udovenko, G. V.
Uptake, re-utilization and some aspects of the physiological effect of chlorine in plants. [Russian, with English summary ½ p.] *Izv. Akad. Nauk SSSR, Ser. biol.*, 1965, No. 3, pp. 368-77, bibl. 22, illus.

Some results are given of soilless culture experiments with beans (*Phaseolus* and *Vicia* spp.), peas and other crop plants using labelled Cl^{36}. Cl was absorbed rapidly and translocated throughout the plant. The absorbed Cl accumulated mainly in those parts which had the highest rate of anabolic activity; the amount of Cl re-utilization was small. High levels of Cl inhibited growth, accelerated ageing, reduced yields, increased the moisture content and lowered transpiration rates. Cl also affected the N metabolism, reducing the total and protein N contents but increasing the free amino acid content of the leaves.

6873. Silkin, L. Ja.
The effect of SH- and SS- groups on the salt resistance of plants. [Russian, with English summary ¼ p.] *Fiziol. Rast.*, 1965, **12**: 110-19, bibl. 41, illus.

Broad bean seeds were soaked under anaerobic conditions in 0·01% solutions of cystine or cysteine or in distilled water, and were then sown. Two days after emergence the soil was irrigated normally or with water containing 0·3% of chloride. Following salinization, plants pre-treated with distilled water died, whereas about 50% of those treated with cystine, and nearly all of those treated with cysteine, survived. Amperometric titrations showed that injury following salinization was associated with a reduction in the SS- group in the roots and leaves, leading to an increase in the SH-/SS- ratio above its normal value of one.

6874. Hill-Cottingham, D. G., and Lloyd-Jones, C. P.
The behaviour of iron chelating agents with plants. *J. exp. Bot.*, 1965, **16**: 233-42, bibl. 12.

The absorption by normal and Fe-deficient bean plants of Fe and of ethylene-diamine-bis-(orthohydroxyphenylacetic acid) (EDHPA) is described; and the metabolism in plants of this chelating agent and of ethylene-diamine-tetra-acetic acid (EDTA) was examined using C^{14}-labelled compounds. Fe-deficient plants absorbed Fe rapidly and preferentially; absorption of the chelate itself was slower but continuous. Normal plants absorbed Fe and chelate in equimolar amounts. Bicarbonate ions in the culture solution inhibited the preferential absorption of Fe by Fe-deficient plants, equimolar amounts of Fe and chelate being taken up. These results are discussed in relation to apparently conflicting reports on Fe and chelate uptake in the literature. The recovery of C^{14} from plants treated with C^{14}-labelled chelates did not reflect the true extent of the breakdown that had taken place: with both EDTA and EDHPA less than half the C^{14} recovered was as unchanged chelate. [From authors' abstract.]—Long Ashton Res. Stat., Univ. Bristol.

6875. HALE, V. Q., AND WALLACE, A.
Effect of pretreatment with chelating agents or with Fe^{59} on Fe^{59} distribution in plants. *Crop Sci.*, 1964, **4**: 489-91, bibl. 16.

Chelating agents were applied to the roots of bush bean [*Phaseolus vulgaris*] seedlings before, with or following subjection of the roots to Fe^{59} applications. In all 3 cases the agent EDDHA appeared to facilitate translocation of Fe^{59} from roots to leaves. Pre-treatment with 10^{-3} M EDDHA increased both uptake and translocation of subsequently applied Fe^{59} to leaves and stems, whereas DTPA had little influence on Fe^{59} uptake and none on translocation. When EDDHA and Fe^{59} were applied at the same time, the accumulation of Fe was reduced but translocation of Fe to the leaves was enhanced. EDDHA applied to plant roots following pre-treatment with ferric ammonium citrate caused Fe which had previously been absorbed by the roots to be translocated to the leaves. These studies indicate that when Fe is supplied to plants in a chelated form it is likely that at least part of the Fe is translocated to the leaves as chelated Fe. An additional study indicated that the presence of EDDHA in the leaves did not decrease the availability of Fe for the synthesis of chlorophyll. [Authors' summary. For an earlier investigation see *H.A.*, 32: 25.]—Univ. Calif., Los Angeles.

6876. DARTIGUES, A.
Les déficiences en zinc chez les végétaux et leurs causes. Revue bibliographique. **(Zinc deficiencies in plants and their causes. A review of the literature.)** [English, German and Russian summaries $\frac{1}{3}$ p. each.] *Ann. agron.*, 1964, **15**: 667-91, bibl. 204.

Pollen and pollination.

(*See also* 7090, 7236, 8188, 8564, 8720, 8895.)

6877. LINSKENS, H. F. (EDITOR).
Pollen Physiology and Fertilization. A Symposium held at the University of Nijmegen, The Netherlands, August 1963. North-Holland Publ. Co., Amsterdam, 1964, 9×6½ in., pp. XII+257, bibls, illus., 92s.

Most of the papers in this symposium are of interest to horticultural research workers, especially to those concerned with plant breeding and with fruit or seed production. A discussion is reported verbatim at the end of each of the 7 sections, which comprise: Physiology of the embryo sac; Biochemistry of pollen wall formation; Metabolism of pollen tubes; Boron and pollen tube growth; Chemotropism of pollen tubes; Controlled fertilization; and The incompatibility barrier. The papers of horticultural interest include: Metabolism in the ovary tissue of *Lilium longiflorum*, by H. Miki-Hirosige (pp. 26-33); Callus synthesis in pollen mother cells of *Cucurbita ficifolia*, by W. Eschrich (pp. 48-51, in German); Proline in the reproductive system of plants, by E. A. Britikov and others (pp. 77-85, with special reference to hops, snapdragons and willows); Metabolism of proline in styles and pollen tubes of *Nicotiana alata*, by J. Tupý (pp. 86-94); The growth effect of some sugars and their metabolism in pollen tubes, by E. Hrabětová and J. Tupý (pp. 95-101, with special reference to apples, *Hyoscyamus niger*, *Asparagus sprengeri*, opium poppies, snapdragons and elder); Effect of boron on pollen germination and pollen tube growth, by I. K. Vasil (pp. 107-19, including melons and eggplants); Studies on the effect of boron on pollen germination and pollen tube growth, by P. Fähnrich (pp. 120-7, in German, concerning petunias and snapdragons); Boron and *myo*-inositol in pollen pectin biosynthesis, by R. G. Stanley and F. A. Loewus (pp. 128-36, concerning pear pollen); The calcium ion and substances influencing pollen growth, by J. L. Brewbaker and B. H. Kwack (pp. 143-51, with special reference to *Crinum asiaticum*); Tropism of pollen tubes to the pistils, by H. Miki-Hirosige (pp. 152-8, including many ornamental plants and some vegetables); Chemotropism and fine structure of pollen tubes, by W. G. Rosen (pp. 159-66, particularly in *Lilium* spp.); Fine structure of germinated petunia pollen, by M. M. A. Sassen (pp. 167-9); Control of fertilization, by P. Maheshwari and K. Kanta (pp. 187-93, in opium poppies, *Eschscholtzia californica*, *Argemone* spp., tobacco and *Nicotiana rustica*); New data on use of radioactive isotopes in studying fertilization of plants, by I. M. Polyakov (pp. 194-9, with reference to tobacco, other *Nicotiana* spp., *Petunia violacea*, *Hibiscus cannabinus* and peas); Effect of multipaternal pollination in plants, by M. Stroun (pp. 200-7, including *Mirabilis jalapa* and tomato varieties); Studies on aqueous extracts from the styles of long- and short-styled flowers of *Primula obconica* in relation to the contents of growth substances that affect pollen germination, by F. H. Schwarzenbach (pp. 225-9, in German); and The influence of emasculation on pollen tube growth after self-pollination, by H. F. Linskens (pp. 230-6, referring to *Petunia hybrida*).

6878. SANTOS, C. F. DE O.
Características morfológicas dos grãos de polem das principais plantas apícolas. **(Morphological characteristics of the pollen grains of the principal bee-pollinated plants.)** [English summary 1 p.] *An. Esc. sup. Agric. Queiroz*, 1963, **20**: 174-228, bibl. 17, illus., [received 1965].

Seventy-eight plants of 68 genera of 25 dicotyledonous and 3 monocotyledonous families.

Radiation and radioactive contamination.

(*See also* 6854.)

6879. KORABLEVA, N. P., AND METLICKIJ, L. V.
The effect of ionizing radiation on growth processes and nucleic acid metabolism in plants. [Russian, with English summary $\frac{1}{3}$ p.] *Izv. Akad. Nauk SSSR, Ser. biol.*, 1965, No. 4, pp. 521-32, bibl. 70, illus.

A review.

6880. HERČÍK, F.
Extreme alpha rays sensitivity of plant stomata cells. *Naturwissenschaften*, 1965, **52**: 260, bibl. 3.

Only two alpha particles were necessary on average to induce the stomata of *Tradescantia viridis* to close. [See also *H.A.*, 35: 2368.]—Czech. Acad. Sci., Brno.

6881. Štupar, J.
Determination of rubidium in agriculturally important materials by atomic-absorption flame photometry. [German.] *Rep. Nukl. Inšt. Jožef Stefan, Ljubljana*, **R-425**, 1964, pp. 11, from *Analyt. Abstr.*, 1965, **12**, Abstr. 2333.

In plants and soils.

6882. Ford, L. A., and Walton, M. S.
A chromatographic method for analysis of strontium-90 in foods. *J. Ass. off. agric. Chem., Wash.*, 1965, **48**: 415-16, bibl. 1.

A column technique is described, and the results are tabulated of Sr^{90} determinations in food samples, including cabbages, broccoli and snap beans, by 3 different methods.

Soilless culture.

(*See also* 7641-7643, 8386.)

6883. Fukala, E.
Hydroskleník pro pěstování zeleniny u průmyslových závodů. **(A glasshouse for the soilless cultivation of vegetables near industrial centres.)** [English, Russian and German summaries ½ p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 95-107, bibl. 12, illus.

The construction is described and the costs are given of a glasshouse suitable for soilless cultivation, in particular of cucumbers. The structure was designed primarily for industrial sites with available waste or cheap heat, or for erection near thermal springs, with due consideration of air pollution and mineral sediments, respectively.

Tissue culture.

(*See also* 6922, 7215, 7223, 7308, 7909, 8120, 8151, 8292, 8401, 8426, 8475, 8548, 8835.)

6884. Tulecke, W., Taggart, R., and Colavito, L.
Continuous cultures of higher plant cells in liquid media. *Contr. Boyce Thompson Inst.*, 1965, **23**: 33-46, bibl. 55, illus.

A system, called the phytostat, for the continuous growth of tissue cultures from higher plants was devised. Tomato tissue proved difficult to grow in liquid media. Carrot and rhubarb tissues grew in large aggregates, but would not remain friable enough for continuous culture. Rose tissue was more suitable and grew faster than that of *Ginkgo biloba*, approximately 40 lb. fresh weight being produced by 7 continuous cultures which were harvested periodically over a combined total of 222 days.

6885. Ménagé, A., and Morel, G.
Métabolisme de l'arginine dans les tissus de tumeurs de crown-gall cultivé *in vitro*. **(Arginine metabolism in the tissues of crown gall tumours cultured *in vitro*.)** *Physiol. vég.*, 1964, **2**: 1-8, bibl. 29, illus.

In scorzonera tissue culture experiments it was shown that crown gall tissues metabolised arginine in a very special way. No arginase activity was found, but the amino acid was transformed into several guanidines, one of which was identified as γ-guanidobutyric acid.—Stat. cent. Physiol. vég., Versailles.

6886. Melnick, V. L. M.
Physiological studies on fruit development using *in vivo* organ transplantation. *Diss. Abstr.*, 1964, **25**: 3224-5, being *Order No.* 64-13,903 of 98 pp.

See *H.A.*, 35: 87.

Physiology, metabolism and biochemistry.

(*See also* 7102, 7665, 7859, 8173, 8174, 8283, 8603.)

6887. Salisbury, F. B.
The initiation of flowering. *Endeavour*, 1965, **24**: 74-80, bibl. 32, illus.

A review.

6888. Resende, F.
Senescence induced by flowering. (Revision.) *Portugal. Acta biol.*, 1964, **8**: 248-66, bibl. 41, illus.

The following aspects of the subject are reviewed: the balance between the vegetative and the flowering stages; the deleterious effects of the flowers on other plant parts; the mechanism and the control by growth substances of senescence induced by flowering; changes from the vegetative to the flowering stage and *vice versa* induced by growth substances; senescence induced by flowering in *Bryophyllum*; senescence and endopolyploidy. [See also *H.A.*, 35: 3899.]

6889. Valdovinos, J. G., and Muir, R. M.
Effects of D and L amino acids on foliar abscission. *Plant Physiol.*, 1965, **40**: 335-40, bibl. 20.

A fuller account of work abstracted in *H.A.*, 35: 2389.

6890. Hopkins, W. G., and Hillman, W. S.
Phytochrome changes in tissues of dark-grown seedlings representing various photoperiodic classes. *Amer. J. Bot.*, 1965, **52**: 427-32, bibl. 17, illus.

Excised tissues of dark-grown seedlings, including the long-day species *Phaseolus coccineus* and radish, the short-day species *Xanthium pennsylvanicum* and the day length-indifferent *P. vulgaris* and pea, were assayed for non-photochemical changes in phytochrome. In all the tissues tested these changes were qualitatively the same. A brief irradiation with red light was followed in darkness by a decrease in total phytochrome, the disappearance of P_{FR} and an increase in detectable P_R. Within the limits of the tissues tested the kinetics of phytochrome change can be assigned to 3 groups on the basis of rates. These groups are represented by coleoptiles, hypocotyls and epicotyls [in each of the above 5 species], and mesocotyls. The kinetics could not be distinguished on the basis of the photoperiodic class of the mature plant. The significance of these kinetics with respect to the photochemistry of phytochrome conversion is discussed. [From authors' abstract.]—Brookhaven nat. Lab., Upton, N.Y.

6891. Mohr, H., Wagner, E., and Hartmann, K. M.
Zur Deutung der Hochenergiereaktion der Photomorphogenese (=HER) auf der Basis des Phytochromsystems. **(The interpretation of the high-energy reaction of photomorphogenesis on the basis of the phytochrome system.)** *Naturwissenschaften*, 1965, **52**: 209, bibl. 8.

Studies using lettuce seedlings. [See also *H.A.*, 34: 1975.]

6892. Steer, B. T., and Walker, D. A.
Inhibition of chlorophyll synthesis by high concentrations of carbon dioxide. *Plant Physiol.*, 1965, **40**: 577-81, bibl. 15.

In the presence of 20% O_2, concentrations of CO_2 of 10% and above inhibited chlorophyll production in etiolated leaves of dwarf french beans and other plants. On return to air, recovery from this inhibition was rapid. High concentrations of CO_2 were also inhibitory when illumination was discontinuous. [From authors' summary.]—Queen Mary Coll., Univ. Lond.

6893. Lundegårdh, H.
Cytochromes as regulators of photosynthetic O_2-production. *Physiol. Plant.*, 1965, **18**: 269-74, bibl. 14.

Experiments using spinach leaves.

6894. El-Sharkawy, M. A., and Hesketh, J. D.
Effects of temperature and water deficit on leaf photosynthetic rates of different species. *Crop Sci.*, 1964, **4**: 514-18, bibl. 12.

For 4 unrelated species [including the ornamental *Thespesia populnea*] leaf net photosynthetic rates were depressed by high water deficits and high temperatures. At high temperatures leaves were fully turgid and stomata were fully open; therefore, it is doubtful if transpiration was slowed down when photosynthesis was depressed. The temperature optima for photosynthesis occurred at higher temperatures for leaves with the greater maximum photosynthetic rates. Except for sorghum, leaves were visibly wilted before photosynthesis was depressed by water deficit; in fact, some wilted leaves still had maximum rates. [From authors' summary.]—Ariz. agric. Exp. Stat., Tucson.

6895. Mašanskij, V. F., Semihatova, O. A., and Bušueva, T. M.
The relationship between the morphological and biochemical characteristics of damaged mitochondria. [Russian, with English summary 7 lines.] *Bot. Žurnal*, 1965, **50**: 639-46, bibl. 20, illus.

Changes in the mitochondria induced by treatment of pea seedlings at 47° C. and −20 to −25° C. and by Ca deficiency.

6896. Thaine, R.
Surface associations between particles and the endoplasmic reticulum in protoplasmic streaming. *New Phytol.*, 1965, **64**: 118-30, bibl. 32, illus.

Observations on protoplasmic streaming in staminal hair cells of *Tradescantia virginiana* and leaf hair cells of *Primula obconica* and *Perilla frutescens*.

6897. Stålfelt, M. G.
The relation between the endogenous and induced elements of the stomatal movements. *Physiol. Plant.*, 1965, **18**: 177-84, bibl. 13.

In *Vicia faba*. [See also *H.A.*, 34: 3980.]

6898. Cowan, I. R.
Transport of water in the soil-plant-atmosphere system. *J. appl. Ecol.*, 1965, **2**: 221-39, bibl. 23.

Water movement in response to gradients of water potential in the soil-plant-atmosphere catena is considered. An approximate solution is presented of the differential equation describing soil moisture flow towards a plant root which is absorbing water at a periodically varying rate. This is combined with hypothetical plant characteristics to form a model of the hydraulic behaviour of a crop. The characteristics specified are the depth of penetration of roots into the soil, the density of rooting (length of root per c.c. of soil volume), the internal resistance of the crop to the flow of water and the critical value of leaf water potential which is associated with stomatal closure. [From author's summary.]—Univ. Nottingham Sch. Agric., Sutton Bonington.

6899. Haranjan, N. N.
The water-retaining capacity of leaves of wilting plants differing in their drought resistance. [Russian.] *Fiziol. Rast.*, 1965, **12**: 170-2, bibl. 10.

The water-retaining capacity of the leaves of both the non-wilted and wilted test plants (corn, broad beans and millet) increased in the same order as their drought resistance. The water-retaining capacity of the leaves was higher in wilted plants than in the controls, the difference being greater in the more drought-resistant plants.

6900. Jacoby, B.
The effect of ATP on uptake of monovalent cations and anions by red beet slices. *J. exp. Bot.*, 1965, **16**: 243-8, bibl. 18.

Externally added ATP inhibited Na and K uptake by red beet tissue; this inhibition seemed to be competitive. The effects of DNP and ATP additions on cation uptake were found to be additive. ATP did not inhibit chloride and bromide uptake. [From author's abstract.]—Hebrew Univ., Rehovot, Israel.

6901. King, N. J., and Bayley, S. T.
A preliminary analysis of the proteins of the primary walls of some plant cells. *J. exp. Bot.*, 1965, **16**: 294-303, bibl. 20, illus.

Amino-acid analyses on hydrolysates of the wall, microsomal and soluble fractions of Jerusalem artichoke tubers and pea stems showed that the wall fractions alone contained hydroxyproline. In the case of Jerusalem artichoke, this substance was positively identified as l-hydroxyproline. Analyses of the tuber tissue showed that the amounts of protein and hydroxyproline in the walls increased with growth. [From authors' abstract.]—Nat. Res. Coun., Ottawa.

6902. Sinha, S. K., and Cossins, E. A.
The importance of glyoxylate in amino acid biosynthesis in plants. *Biochem. J.*, 1965, **96**: 254-61, bibl. 40.

C^{14}-labelled glyoxylate was rapidly metabolized by carrot storage tissue and pea roots, cotyledons and leaves, mainly to CO_2, glycine and serine.—Univ. Alberta, Edmonton.

6903. Cossins, E. A., and Sinha, S. K.
The utilization of carbon-1 compounds by plants. II. The formation and metabolism of formate by higher plant tissues. *Canad. J. Biochem.*, 1965, **43**: 685-98, bibl. 41.

Experiments with peas, radishes, castor beans, carrots and other plants indicated that formate-C^{14} can be oxidized to CO_2 by formic dehydrogenase, and can serve as a precursor of C-1 units to be utilized for the biosynthesis of serine and methionine. [For part I see *H.A.*, 35: 2417.]—Univ. Alberta, Edmonton.

6904. Zelitch, I.
The relation of glycolic acid synthesis to the primary photosynthetic carboxylation reaction in leaves. *J. biol. Chem.*, 1965, **240**: 1869-76, bibl. 33.

Studied in tobacco leaf discs.

6905. CHENIAE, G. M.
Phosphatidic acid and glyceride synthesis by particles from spinach leaves. *Plant Physiol.*, 1965, **40**: 235-43, bibl. 44.

A study of the process by which 1,3-C^{14}-L-glycerol-3-phosphate is incorporated into lipid, using spinach leaf enzymes.

6906. THURMAN, D. A., PALIN, C., AND LAYCOCK, M. V.
Isoenzymatic nature of L-glutamic dehydrogenase of higher plants. *Nature*, 1965, **207**: 193-4, bibl. 4, illus.

Demonstrated in extracts of pea and broad bean seeds and in germinating pea seeds and seedlings.

6907. ZAHNLEY, J. C., AND AXELROD, B.
D-Xylulokinase and D-ribulokinase in higher plants. *Plant Physiol.*, 1965, **40**: 372-8, bibl. 28.

Present in pea seeds and spinach leaves. [For related work see *H.A.*, 35: 124.]

6908. HALL, D. M., AND OTHERS.
Infra-specific variation in wax on leaf surfaces. *Aust. J. biol. Sci.*, 1965, **18**: 323-32, bibl. 16, illus.

Electron microscope studies of glaucous and sub-glaucous or non-glaucous leaf surfaces of *Eucalyptus urnigera, Poa colensoi*, peas and cauliflowers.

6909. BURG, S. P., AND BURG, E. A.
Ethylene action and the ripening of fruits. *Science*, 1965, **148**: 1190-6, bibl. 78.

A review.

Growth substances.

(*See also* 7109, 7111, 7123, 7126, 7128, 7203, 7204, 7223-7227, 7240, 7241, 7444-7447, 7471, 7686, 7856-7858, 8133, 8158, 8349, 8402, 8923, 9017.)

6910. MASUDA, Y.
RNA in relation to the effect of auxin, kinetin, and gibberellic acid on the tuber tissue of Jerusalem artichoke. *Physiol. Plant.*, 1965, **18**: 15-23, bibl. 21.

Kinetin (at 1 p.p.m.) alone had little effect on tissue expansion, but it increased the expansion induced by auxin (2,4-D, at 1 p.p.m.). GA also enhanced the tissue expansion due to auxin and to auxin plus kinetin. Pre-treatment of the tissue with GA also enhanced the subsequent action of auxin, the optimal concentration of GA being 50-60 p.p.m. The effects of auxin, auxin plus kinetin, auxin plus GA and the 3 together were reduced when the tissue was pre-treated with ribonuclease. GA treatment, unlike auxin treatment, did not make the tissue immune to the effect of ribonuclease. Without auxin, no synergism was observed between kinetin and GA. It was inferred that GA makes cells responsive to auxin, auxin acts through a change in cellular RNA, and kinetin co-operates with auxin. [From author's summary.]—Osaka City Univ., Sumiyoshi-ku, Japan.

6911. DE HERTOGH, A. A., AND OTHERS.
The effect of antagonists of RNA and protein biosynthesis on IAA and 2,4-D induced growth of green pea stem sections. *Contr. Boyce Thompson Inst.*, 1965, **23**: 23-31, bibl. 36.

The inhibitory effects of 8-azaguanine, chloramphenicol, puromycin and actinomycin D.

6912. RITZERT, R. W., SELL, H. M., AND BUKOVAC, M. J.
The synthesis and biological activity of several ethyl 1-acylindole-3-acetates. *Phytochemistry*, 1965, **4**: 461-6, bibl. 20.

Using the tomato ovary growth assay, the bean petiole abscission assay and the *Avena* straight-growth assay.

6913. RUDDAT, M., HEFTMANN, E., AND LANG, A.
Chemical evidence for the mode of action of AMO-1618, a plant growth retardant. *Naturwissenschaften*, 1965, **52**: 267, bibl. 4.

The growth retardant prevented the conversion of mevalonic acid to gibberellin in cultures of *Fusarium moniliforme.* [See also *H.A.*, 35: 5735.]—Calif. Inst. Tech., Pasadena.

6914. CATHEY, H. M.
Plant selectivity in response to variation in the structure of Amo-1618. *Phyton, Argentina*, 1965, **22**: 19-26, bibl. 16.

Fourteen quaternary ammonium carbamates were evaluated for the growth control of 28 kinds of plant. Equal molar solutions were applied as a spray to the young expanding leaves and growing points. Activity was based on the percentage reduction in the height of the plant. The most active compounds were those which were varied structurally in the carbamate and in the 2 isomeric terpene radicals as follows: piperidine carboxylate with either thymol (Amo-1618, I) or carvacrol (II); dimethyl carbamate with either thymol (III) or carvacrol (IV). They were active, respectively, on 6 (I), 11 (II), 10 (III) and 2 (IV) species of the 28 tested. All cultivars and species tested in the same genus exhibited a similar spectrum of selectivity to the chemicals. The spectrum of activity from one genus to the next followed no phylogenetic concept. The significance of orientation of the molecule and size of the substitutions is discussed. [From author's abstract.] The test plants included several ornamentals, tomatoes, beans and castor beans.—U.S.D.A., Beltsville, Md.

6915. REED, D. J.
Tryptamine oxidation by extracts of pea seedlings: effect of growth retardant β-hydroxyethylhydrazine. *Science*, 1965, **148**: 1097-9, bibl. 16.

β-Hydroxyethylhydrazine at $3{\cdot}3\times10^{-7}$M almost completely inhibited the oxidation of tryptamine to indoleacetaldehyde by extracts of pea seedlings.—Ore. St. Univ., Corvallis.

6916. COLLET, G., DUBOUCHET, J., AND PILET, P.-E.
Étude, par chromatographie sur couche mince, de quelques composés indoliques. Méthodes et premiers résultats. **(A study, by thin-layer chromatography, of some indolic compounds. Methods and preliminary results.)** [English summary ½ p.] *Physiol. vég.*, 1964, **2**: 157-94, bibl. 54, illus.

Studies were made on 26 indolic compounds frequently present in plant tissues, on some impurities found in a newly prepared solution of IAA and on the nature of the growth substances and indolic compounds extracted from *Phaseolus* roots. A bioassay method of testing the activity of auxins separated by chromatography is proposed.—Lab. Physiol. vég., Lausanne.

6917. Riddle, V. M., and Mazelis, M.
Conversion of tryptophan to indoleacetamide and further conversion to indoleacetic acid by plant preparations. *Plant Physiol.*, 1965, **40**: 481-4, bibl. 25.

Using preparations from cabbage and horse-radish.

6918. Jacobs, W. P., and Case, D. B.
Auxin transport, gibberellin, and apical dominance. *Science*, 1965, **148**: 1729-31, bibl. 24.

The application of 1% IAA plus 1% GA in lanolin paste to decapitated pea shoots restored apical dominance more effectively than IAA alone. Translocation studies using C^{14}-labelled IAA showed that GA caused more IAA to be present and effective far from the site of application. [From authors' abstract.]—Princeton Univ., N.J.

6919. Bianchetti, R.
Azione dell'auxina sull'utilizzazione di glicerolo-1-^{14}C in segmenti di internodi di pisello. **(The effect of auxin on the utilization of glycerol-1-^{14}C in pea internode segments.)** [English summary 9 lines.] *G. bot. ital.*, 1963 (issued 1964), **70**: 437-44, bibl. 10.

Treatment of the segments with IAA increased the rate at which they metabolized radioactive glycerol, especially its incorporation into monosaccharides, and significantly reduced its incorporation into fats.—Univ. Milano.

6920. Fang, S. C., and Yu, T. C.
Influence of auxins on *in vitro* incorporation of glycine-C^{14} in pea shoot proteins. *Plant Physiol.*, 1965, **40**: 299-303, bibl. 14.

Glycine-C^{14} incorporation into the proteins of excised shoot tissue was enhanced by IAA and 2,4-D at concentrations which promoted an increase in weight of the fresh tissue. Inhibitory levels of these growth substances reduced glycine absorption.—Ore. St. Univ., Corvallis.

6921. Nance, J. F., and McMahon, V. A.
Transient effects of indoleacetic acid on the absorption and utilization of radioactive acetate by pea stem slices. *Plant Physiol.*, 1965, **40**: 316-20, bibl. 7.

Stem slices pre-treated in an acetate solution and then exposed briefly to C^{14}-labelled acetate took up more of the labelled substrate, but incorporated less C^{14} into other materials, than slices which were pre-treated in water or a solution of an inorganic salt. These pre-treatment effects were enhanced by IAA. With relatively high concentrations of acetate in the pre-treatment solution the enhancing effects of IAA were lower or disappeared entirely.—Univ. Ill., Urbana.

6922. Loewenberg, J. R.
Promotion of indoleacetic acid destruction by citric acid and L-alanine. *Physiol. Plant.*, 1965, **18**: 31-40, bibl. 26, illus.

In a tobacco callus tissue culture medium.

6923. Sänger, H. L.
Hemmung des Längenwachstums von *Vicia faba* L. durch die N-dimethylmonoamide der Malein- und Bernstein-Säure. **(Inhibition of extension growth in *Vicia faba* by the N-dimethylmonoamides of maleic and succinic acids.)** *Naturwissenschaften*, 1965, **52**: 266-7, bibl. 6.

When used at the optimum concentration these substances reduced extension growth by 65–68%.—Inst. Phytopath., Univ. Giessen.

6924. Mitchell, J. W., Marth, P. C., and Freeman, G. D.
Apical dominance in bean plants controlled with phthalamic acids. *J. agric. Food Chem.*, 1965, **13**: 326-9, bibl. 5, illus.

Nine new phthalamic acids were found to be active growth regulators when applied to stems of young bean plants, 6 approximating the activity of the known regulator *N*-(1-naphthyl)-phthalamic acid when applied at the rate of 125 µg. per plant. These compounds inhibited terminal growth and accelerated the growth of lateral buds. Applied to the stem, *N*-(3-nitro-1-naphthyl)phthalamic and *N*-(5-acenaphthenyl)-phthalamic acids caused an abscission zone to develop in the second internode and abscission of the terminal bud. A fraction of 1 µg. of the nitro-substituted acid induced abscission when applied to that area of stem capable of developing an abscission zone. Although very effective when applied to stems or roots, this acid did not affect terminal growth when applied to leaves. *N*-(5-Acenaphthenyl)phthalamic acid increased the growth of lateral buds and decreased the amount of fruit that developed. Some of the phthalamates were apparently inactivated rapidly by the plant. [Authors' abstract.]—U.S.D.A., Beltsville, Md.

6925. Muller, C. H.
Inhibitory terpenes volatilized from *Salvia* shrubs. *Bull. Torrey bot. Cl.*, 1965, **92**: 38-45, bibl. 6, illus.

Gas chromatography studies showed that the air around *Salvia leucophylla* and *S. mellifera* (in the field or greenhouse) contains two terpenes, apparently cineole and camphor. The several terpenes of *S. leucophylla* were highly soluble in hard paraffin, suggesting that they are taken into the seedlings they inhibit by being dissolved in the cutin of the mesophyll. [From author's abstract. For earlier work see *H.A.*, 34: 4003 and 35: 1648.]—Univ. Calif., Santa Barbara.

Weed control and herbicides.

(*See also* 7655.)

6926. Agricultural Research Council.
Weed Research Organisation. First Report 1960-1964, 1965, pp. 56, illus.

The first part of this report consists of 4 short articles, including: The Weed Research Organisation (its origin and work), by J. D. Fryer; Weed seeds in the soil, by R. J. Chancellor; and Soil-applied herbicides, by R. J. Hance. Research work is reported under the following, among other, Section headings: *Evaluation Section* (pp. 27-33): Tolerance of peas and beans to herbicides; persistence of 2,3,6-TBA residues in straw used for growing glasshouse crops. *Horticultural Section* (pp. 36-9): The evaluation of new herbicides for use in fruit and flower crops; non-cultivation trials in raspberries and strawberries; the selective action of soil-applied herbicides on apple and rose rootstocks, strawberries, anemones and dahlias.

6927. Texas Agricultural Experiment Station.
Suggestions for weed control with chemicals. [*Publ.*] *Tex. agric. Ext. Serv.* **B-1029**, 1965, pp. 48, illus.

Tabulated data on weed control in irrigated vegetables, peaches, citrus and turf.

6928. Springett, R. H.
The bipyridylium herbicides: their properties and use. *Outlook on Agric.*, 1965, **4**: 226-33, bibl. 9, illus.

Paraquat and diquat, including their use in orchards, vineyards and tropical crops.

6929. Frigato, V.
L'impiego dei diserbanti-disseccanti dipiridilici in orticoltura. **(The use of bipyridylium herbicide-desiccants in horticulture.)** *Not. Mal. Piante*, 1964, No. 70/71, pp. 275-9.

Mode of action and uses of diquat and paraquat.

6930. Ahrens, J. F.
Antidote for herbicides. *Frontiers Plant Sci.*, 1964, **17**(1): 5, 7, illus., from *Trop. Abstr.*, 1965, **20**: Abstr. n987.

Investigations conducted in Connecticut showed that horticultural crops can be protected against the residual action of herbicides by mixing the soil with finely divided activated carbon; the amount of carbon applied should be about 200 times the weight of the herbicide residue. Young plants can be protected by watering them with a 1–2% suspension of activated carbon, or by dipping the root system into activated carbon before transplanting.

Plant protection.

(*See also* 8069, 8448.)

6931. Rich, S. (Editor).
Perspectives of biochemical plant pathology. *Bull. Conn. agric. exp. Stat.* **663**, 1963, pp. 191, bibls.

The symposia and lectures commemorating the 75th anniversary of the Department of Plant Pathology and Botany of the Connecticut Agricultural Experiment Station are presented in full. Section I, on the natural biochemical resistance to disease in plants, contains the following papers: The biochemical basis of disease resistance induced by infection, by I. Uritani (pp. 4-14); The role of phenolic compounds in disease resistance, by J. Kuć (pp. 20-5); and Natural inhibitors of fungal enzymes and toxins in disease resistance, by R. J. W. Byrde (pp. 31-41). Section II, on plant chemotherapy, comprises the following papers: Progress in research on absorption, translocation and exudation of biologically active compounds in plants, by J. W. Mitchell (pp. 49-56); The modes of action of chemotherapeutic agents in plants, by A. E. Dimond (pp. 62-72); and Chemically induced rust resistance, by B. J. Samborski (pp. 78-87). Section III contains 3 papers on fungicidal action.

6932. de Weille, G. A.
The epidemiology of plant disease as considered within the scope of agrometeorology. *Agric. Met.*, 1965, **2**: 1-15, bibl. 35.

Forecasting.

6933. Ministry of Agriculture, London.
Chemicals for the gardener. [*Publ.*] *Minist. Agric., Lond.*, 2nd Edition, 1965, pp. 35.

Garden pests and diseases are listed under their common names, with the chemicals and approved proprietary products recommended for the control of each. There is also a list of herbicides recommended for use in given situations.

6934. McGrath, H.
Chemicals for plant disease control. *Agric. Chemic.*, July, August, September, 1964, reprinted in *Pest Articles News Summ., Sect. B*, 1965, **11**: 141-78.

This list, compiled by a member of the U.S.D.A., gives the common, chemical and proprietary names of 279 fungicides, nematicides, antibiotics and seed-treatment compounds, and covers as far as possible all such chemicals in present use.

6935. Smith, S. H., and Schlegel, D. E.
The incorporation of ribonucleic acid precursors in healthy and virus-infected plants cells. *Virology*, 1965, **26**: 180-9, bibl. 23, illus.

Tritiated uridine was selectively incorporated into the nucleus and nucleolus of cells of actinomycin D-treated tobacco leaf discs infected with tobacco mosaic virus and *Vicia faba* root tips infected with clover yellow mosaic virus. Healthy tobacco and *V. faba* cells treated with actinomycin D did not show such an incorporation. It is suggested that virus-directed RNA synthesis takes place in the nucleolus, and that at least some of this RNA is virus RNA. [From authors' summary.]—Univ. Calif., Berkeley.

6936. Proefstation voor de Fruitteelt, Wilhelminadorp.
Bladvlekkenziekte (*Marssonina*) op populieren-windschermen. (***Marssonina* leaf spot disease in poplar windbreaks.**) *Groent. en Fruit*, 1965, **20**: 1857.

Best control in 1964 was obtained with captan or thiram. [See *H.A.*, 34: 2532.]

6937. Grewe, F., and Kaspers, H.
Morestan, a new fungicide of the 2,3-disubstituted quinoxaline group for controlling powdery mildews. *PflSch.-Nachr. Bayer*, 1965, **18**: 1-23, bibl. 42.

A review of the chemical and physical properties, toxicology, acaricidal and fungicidal effects (on top and small fruits, vines, vegetables, ornamentals and tobacco), residues and safety intervals of Morestan (6-methyl-quinoxaline-2,3-dithiolcarbonate).

6938. Wäckers, R., and van den Berge, C.
Experiences with Morestan in Dutch fruit farming and market gardening. *PflSch.-Nachr. Bayer*, 1965, **18**: 34-44, bibl. 19, illus.

Morestan (6-methyl-quinoxaline-2,3-dithiolcarbonate) gave eradicative control of mildew (*Erysiphe cichoracearum*) on glasshouse cucumbers when applied in late July at 0·025% and again 10 days later at the same rate, and of apple mildew (*Podosphaera leuchotricha*) when applied at 0·03% 8 times beginning in early July with 4 treatments at 3-day intervals and continuing at weekly intervals. Morestan also gave good results against red spider mite (*Metatetranychus ulmi*) on apples when applied at 0·03% 3 times at weekly intervals beginning in late June; the number of eggs and larvae per 150 leaves in mid-July were 19 (757 in the control) and nil (501), respectively. In a trial on glasshouse roses, in which 4 materials were applied on 31 October for the control of *Tetranychus urticae*, Morestan at 0·035% gave the best results. After 1 week the number of adults and larvae per 25 leaves with Morestan, 0·15% Gusathion WP, 0·1% Tetrasul, 0·05% Systox and in the control were 161, 940, 1,096, 465 and about 5,000 respectively. The corresponding figures for eggs were 328, 1,940, 180, about 10,000 and about 11,000, respectively. In a comparison of the effects of various mildew/scab fungicide mixtures on the incidence of russeting on apples Morestan plus captan, Morestan plus zineb (Lonacol) and Morestan plus Tuzet (0·075%) were all satisfactory; Morestan plus TMTD is not recommended. In another trial petal burn was less with Morestan than with some other fungicides applied during blossoming. In a comparison of several fungicides applied alone and in mixture 4 times between the pink-bud stage and petal-fall the percentage fruit-set of Golden Delicious was highest with the only treatment that included Morestan, namely, Morestan plus captan, which gave 20·2% set compared with 14·8–19% with the other treatments.

6939. Sayre, R. M., Patrick, Z. A., and Thorpe, H.
Substances toxic to plant-parasitic nematodes in decomposing plant residue. From abstr. in *Phytopathology*, 1964, **54**: 905.

Substances (obtained from decomposed residues of rye), capable of inhibiting the root growth of tobacco and lettuce seedlings [see *H.A.*, 32: 4751], were tested *in vitro* as nematicides against *Meloidogyne incognita* and *Pratylenchus penetrans*. There was a linear relationship between the concentrations of the decomposition products and the percentage of nematodes immobilized or killed in solution and in soil. The substances also partly inhibited the penetration of roots of cucumber plants by both nematodes. This is the first instance in which plant-derived decomposition products have been shown to have nematicidal activity.—Canada Dep. Agric., Harrow, Ont.

6940. Priščep, L. G., Sergeev, A. V., and Elhovskaja, M. E.
The use of high-voltage devices for killing flying parasitic insects in orchards and gardens. [Russian.] *Izv. Timirjazev. sels'k. Akad.*, 1965, No. 1, pp. 213-21, bibl. 3, illus.

The insects were attracted by electric lamps to an electrified grid (2,500 v.) where they were killed. A comparison was made of the effectiveness of different kinds of lamp for attracting the insects and of different types of grid for killing them. Open grids were usually more effective than cylindrical ones.

6941. Anon.
The Vapona pest strip. A new approach to insect control. *Span*, 1965, **8**: 11, illus.
La striscia antiparassitaria Vapona: un nuovo metodo di lotta insetticida. **(The Vapona pest strip. A new approach to insect control.)** *Inf. fitopat.*, 1965, **15**: 162, illus.

The formulation consists of a solid solution of Vapona (based on DDVP) in a PVC resin strip 10×2½ in. in size, for hanging from the ceiling of mushroom houses or from overhead wires in greenhouses. The vapour controls insect pests within 1,000 cu. ft. for 10–15 weeks, depending on the environmental conditions, particularly R.H. and ventilation. The second paper is an Italian version of the first.

6942. Ministry of Agriculture, London.
Glasshouse symphylids. *Adv. Leafl. Minist. Agric., Lond.*, **484**, 1965, pp. 6, illus.

The damage caused by *Scutigerella immaculata*, the plants attacked and control measures (chemical soil sterilization, and soil drenches with parathion, gamma-BHC and diazinon).

Chemical residues and their analysis.

(*See also* 7953, 8707, 8825.)

6943. Murphy, R. T., Gaston, L. K., and Gunther, F. A.
Colorimetric analytical method for Bidrin residues in alfalfa, celery, lemon peel, lettuce, orange peel, potatoes, string beans, and tomatoes. *J. agric. Food Chem.*, 1965, **13**: 242-4, bibl. 3, illus.

A procedure for the determination of microgram quantities of the dimethyl phosphate of 3-hydroxy-dimethyl crotonamide.

6944. Koivistoinen, P., and others.
Extraction of malathion residues from fruits. *J. agric. Food Chem.*, 1965, **13**: 347-9, bibl. 20.

Stripping unmacerated fruits with benzene as an extraction method for malathion post-harvest residues on apples, gooseberries and tomatoes was compared with 3 other methods, namely, blending the crop in water with subsequent tumbling with benzene, blending in ethanol with subsequent tumbling with benzene, and drastic blending in chloroform followed by additional extractions with a methanol-acetone mixture. In all cases stripping the unmacerated crops gave the highest values of initial deposits and in most cases also the highest residue recoveries during the first few days after malathion application; later, slightly higher recoveries were obtained from the blended macerated materials. [From authors' abstract. See also abstract 7622.]—Univ. Helsinki, Finland.

6945. Getz, M. E.
A preliminary investigation into the quantitative determination of organophosphorus pesticide residues by conversion to orthophosphate ion. *J. Ass. off. agric. Chem., Wash.*, 1964, **47**: 1103-5, bibl. 4.

The method described, with results for apples, strawberries and cabbages.

6946. Getz, M. E., and Watts, R. R.
Application of 4-(*p*-nitrobenzyl)pyridine as a rapid quantitative reagent for organophosphate pesticides. *J. Ass. off. agric. Chem., Wash.*, 1964, **47**: 1094-6, bibl. 3, illus.

A rapid colorimetric determination for organophosphate pesticides is reported. The basis for this method is the reaction between nitrobenzyl pyridine and the phosphate pesticide in a slightly basic solution at 175–180° C. The method reported is rapid and has a sensitivity of approximately 2 μg. of an organophosphate pesticide. Recoveries are presented for several crops [including strawberries, apples and cabbages] fortified at 1 p.p.m. Interferences were noted for some types of crop, and the need for further clean-up work was indicated. [Authors' summary.]—Div. Food Chem., Food and Drug Admin., Wash., D.C.

6947. Giuffrida, L., and Ives, F.
Investigation of two gas chromatographic techniques for the determination of organophosphate pesticide residues. *J. Ass. off. agric. Chem., Wash.*, 1964, **47**: 1112-16, bibl. 3, illus.

Gas chromatography has been used in a recovery study for the development of a clean-up procedure for organophosphate pesticide residues in various crops [cabbages, spinach and apples]. The effluent from one column was divided evenly between 2 detectors to obtain a dual analysis. A sodium thermionic detector, highly sensitive to phosphorus compounds, was used to give quantitative recovery data. A flame ionization detector was used to determine the efficiency of the clean-up. [Authors' summary.]—Div. Food Chem., Food and Drug Admin., Wash., D.C.

6948. Storherr, R. W., and others.
Identification and analyses of five organophosphate pesticides: recoveries from crops fortified at different levels. *J. Ass. off. agric. Chem., Wash.*, 1964, **47**: 1087-93, bibl. 11, illus.
The recoveries of 5 parent organophosphate pesticides from 8 different fortified crops [vegetables, apples and strawberries] were determined by a "gross" clean-up technique. The primary method of analysis was gas-liquid chromatography. Other determinative methods used for comparison were total phosphorus determination, paper chromatography and determination of phosphorus esters with *p*-nitrobenzyl pyridine reagent. The 5 organophosphate pesticides studied as mixtures and individually were Diazinon, methyl parathion, parathion, malathion and Trithion. The 3 fortification levels in crops were 5·0, 1·0 and 0·1 p.p.m. [Authors' summary.]—Div. Food Chem., Food and Drug Admin., Wash., D.C.

6949. Kovacs, M. F., Jr.
Thin-layer chromatography for organo thiophosphate pesticide residue determination. *J. Ass. off. agric. Chem., Wash.*, 1964, **47**: 1097-1102, bibl. 6, illus.
A rapid and sensitive method is described, and results obtained with carrot, lettuce, apple and strawberry extracts are presented.

Statistical and experimental techniques and equipment.

(*See also* 7369, 8298, 8540, 8541, 8585, 8749, 8750, 8839.)

6950. Holland, D. A.
Sampling errors in an orchard survey involving unequal numbers of orchards of distinct type. *Biometrics*, 1965, **21**: 55-62, bibl. 6.
A study of the sums-of-squares expectations in analyses of variance based on 2 models embracing both fixed and random effects.

6951. Nitsch, J. P.
Phytotrons. *Span*, 1965, **8**: 22-5, bibl. 4, illus.
Descriptions of the Pasadena large room type, the Canberra small cabinet type, the Gif super-glasshouse type and the St. Louis climatron.

6952. Kristoffersen, T.
Utstyr og teknikk ved studiet av klimafaktorenes virkning på plantenes vekst og utvikling. **(Equipment and techniques for the study of the effect of climatic factors on the growth and development of plants.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 267-72, bibl. 6.
Problems of controlling temperature, light, humidity and atmospheric composition in an artificial environment are discussed.

6953. Filby, D. E.
A photoperiod cover. *J. agric. Engng Res.*, 1965, **10**: 89-92, bibl. 6, illus.
A description of a light-tight cover that can be applied automatically by a sequence timer to a 3×6 ft. free-standing staging, and that allows a 32-in. head-room for the plants.

6954. Szeicz, G.
A miniature tube solarimeter. *J. appl. Ecol.*, 1965, **2**: 145-7, bibl. 1, illus.
A miniature version (suitable for measuring radiation in herbage and short grass) of an instrument described previously [see *H.A.*, 35: 223].

6955. Bouyoucos, G. J., and Cook, R. L.
Humidity sensor: permanent electric hygrometer for continuous measurement of the relative humidity of the air. *Soil Sci.*, 1965, **100**: 63-7, bibl. 5, illus.
The grey hydrocal hygrometer is described. It is permanent, accurate, responsive, sensitive, free of hysteresis and polarization, and free of temperature effects. It possesses a hygroscopic property that is not destroyed by washing with distilled water. [From authors' conclusion.]—Mich. St. Univ.

6956. Ivanov, O. V.
The "Gravitron", an automatic laboratory installation for the long-term continuous recording of changes in the biomass of a plant and the simultaneous determination of the amount of water taken up by the root system. [Russian.] *Bot. Žurnal*, 1965, **50**: 517-22, bibl. 5, illus.
Illustrated description of the equipment, and results with beans.

6957. Semihatova, O. A., and Ivanova, T. I.
A method for the manometric determination of respiratory carbon dioxide. [Russian, with English summary ¼ p.] *Fiziol. Rast.*, 1965, **12**: 175-7, bibl. 4.
A practical method based on the principle of absorbing the CO_2 produced during a period of respiration by the KOH arising from the reaction between $KMnO_4$ and $K_4Fe(CN)_6$.

6958. Roždestvenskij, V. I., Čučkin, V. G., and Klešnin, A. F.
The automatic maintenance of a constant range of CO_2 concentrations in installations for the study of the photosynthesis of plants. [Russian, with English summary 5 lines.] *Fiziol. Rast.*, 1965, **12**: 178-81, bibl. 2, illus.
A gas analyser is coupled to a recording potentiometer, which also controls the magnetic valves regulating the gas supply.

6959. Neuwirth, G.
Aufbau und Arbeitsweise eines Feldlabors zur Messung von CO_2-Assimilation und Transpiration in Pflanzenbeständen. **(Construction and use of a field laboratory for the determination of CO_2-assimilation and transpiration in plant communities.)** [Czech and Russian summaries ½ p. each.] *Biol. Plant., Prague*, 1964, **7**: 212-17, bibl. 8, illus.
Lorry-mounted apparatus.

6960. van Bavel, C. H. M., Nakayama, F. S., and Ehrler, W. L.
Measuring transpiration resistance of leaves. *Plant Physiol.*, 1965, **40**: 535-40, bibl. 13, illus.
A method and apparatus suitable for field use described.

6961. Lambert, J. R., and van Schilfgaarde, J.
A method of determining the water potential of intact plants. *Soil Sci.*, 1965, **100**: 1-9, bibl. 15, illus.
The apparatus and method described, with some results for bean plants.

6962. Barrs, H. D.
Psychrometric measurement of leaf water potential: lack of error attributable to leaf permeability. *Science*, 1965, **149**: 63-5, bibl. 9.

Experiments using 2 types of thermocouple psychrometer on leaves of capsicum, tobacco, geranium and sunflower, each at 4 levels of water potential, did not confirm previous findings [*H.A.*, 35: 229] that low permeability could cause gross errors in psychrometric determinations. No source of error other than tissue respiration could be demonstrated. [See also *H.A.*, 35: 230 and 4911.]—C.S.I.R.O., Griffith, N.S.W.

6963. Waisel, Y., and Fahn, A.
A radiological method for the determination of cambial activity. *Physiol. Plant.*, 1965, **18**: 44-6, bibl. 3, illus.

Active and dormant plants of *Acacia tortilis*, *Pistacia lentiscus*, *Zygophyllum dumosum* and *Eucalyptus camaldulensis* were exposed to labelled $C^{14}O_2$ in light for 48 hours. The plants were then left untreated for a week before sectioning. As only the most recently deposited cell-wall materials were labelled with C^{14}, the newly divided and differentiated cells of the active tissues could be easily distinguished. No labelling was observed in dormant plants.—Tel-Aviv Univ., and Hebrew Univ. Jerusalem, Israel.

6964. Parsons, D. F., Bonner, W. D., Jr., and Verboon, J. G.
Electron microscopy of isolated plant mitochondria and plastids using both the thin-section and negative-staining techniques. *Canad. J. Bot.*, 1965, **43**: 647-55, bibl. 24.

Including studies on preparations from etiolated mung beans, cauliflowers, red beet and summer squash.

6965. Goffeau, A., and Bové, J.-M.
Réactions photosynthétiques chez *Brassica chinensis* L. Réactions de Hill et photophosphorylations. [I.] Importance du pH. II. Conditions supplémentaires pour l'obtention de chloroplastes actifs. **(The photosynthetic reactions of *Brassica chinensis*. Hill reactions and photophosphorylations. [I.] The importance of pH. II. Supplementary conditions for obtaining active chloroplasts.)** *Physiol. vég.*, 1964, **2**: 75-93, bibl. 37, illus.; 347-61, bibl. 25.

The method of isolating photosynthetically active chloroplasts described. [For part III see *H.A.*, 35: 5592.]

6966. Schreiber, K.-F.
Der Elektronenblitz als Hilfsmittel zur fotografischen Demonstration und Dokumentation im Obstbau. **(The electron-flashlamp as an aid to photographic demonstration and documentation in fruit growing.)** *ErwObstb.*, 1965, **7**: 129-31, illus.

Illustrated notes on photography in the orchard at night with the use of the flashlamp, and on documentation with colour slides.

6967. Vogt, G.
Günstige Fliessmittelkombination zur papierchromatographischen Trennung von Asparagin und Glutamin. **(Suitable combinations of solvents for separating asparagine and glutamine by paper chromatography.)** *Landw. Forsch.*, 1965, **18**: 89-91, illus.

Propanol, glacial acetic acid and water in the proportion of 7 : 1 : 2 effected very good separation of these 2 amino acids in alcoholic extracts of vine petioles, whereas results with the usual 4 : 1 : 1 mixture of butanol, glacial acetic acid and water were unsatisfactory.—Pfälz. landw. Untersuch.- u. ForschAnst., Speyer.

6968. Aru, L. H., and Mikk, H. T.
On the serological identification of plant proteins. [Russian, with English summary ¼ p.] *Fiziol. Rast.*, 1965, **12**: 182-4, bibl. 13, illus.

An immunoelectrophoretic method.

6969. Becker, M.
Determination of reducing sugars in vegetables. [German?] *Z. landw. Versuchs- Untersuchungsw.*, 1964, **10**(1): 75-84, from *Analyt. Abstr.*, 1965, **12**, Abstr. 3423.

6970. Billot, J.
Méthode de dosage des chlorophylles en présence d'anthocyanes. **(A method of determining chlorophylls in the presence of anthocyanins.)** [English summary 8 lines.] *Physiol. vég.*, 1964, **2**: 195-208, bibl. 10.

6971. Pohloudek-Fabini, R., and Fürtig, W.
Über ein verbessertes papierchromatographisches Verfahren zur photometrischen Bestimmung der Ascorbinsäure. **(An improved procedure with paper chromatography for the photometric determination of ascorbic acid.)** *Pharmazie*, 1965, **20**: 128-35, bibl. 24.

6972. Chvojka, L., and others.
Beitrag zur Methodik der Trennung freier Nukleotide bei Gehölzen. **(A contribution to the method of separating free nucleotides in woody plants.)** [Russian and English summaries ⅓ p. each.] *Arch. Gartenb.*, 1964, **12**: 599-604, bibl. 6.

An ion-exchanger was used to separate the free nucleotides chromatographically from apple leaves and fruits that had been labelled with P^{32}. The radioactivity curve obtained during the separation of the free nucleotides could be used to determine the nucleotide content.—Czech. Acad. Sci., Prague.

6973. Furuya, T.
Gas-liquid chromatography of plant glycosides. *J. Chromatog.*, 1965, **18**: 152-6, bibl. 8.

The method has proved successful for the determination of the active principles in a number of ornamental and medicinal plants.

6974. Hewitt, E. J., James, D. M., and Lloyd-Jones, C. P.
A comparison of methods for the removal of cobalt and vanadium from salts used in plant nutritional studies. *Plant Physiol.*, 1965, **40**: 326-31, bibl. 24.

6975. Allen, M., and Whitfield, A. B.
Rapid methods for the routine determination of major nutrient elements and iron and manganese in leaves of fruit trees. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 143-7, bibl. 6.

Simple colorimetric and flame photometric micromethods are described whereby some thousands of leaf samples are analysed annually for N, P, K, Ca, Mg, Fe and Mn. Sources of errors in the field, in laboratory sub-sampling and in analysis are considered. It is shown that the variation associated with field sampling is 5 to 10 times greater than that associated with laboratory procedure. It would therefore be better to increase the number of samples taken from the field rather than to try to improve the accuracy of the analytical methods, if the precision of results from our field experiments is to be improved. [Authors' abstract.]

6976. Guennelon, R.
Dosages d'oligoéléments dans les végétaux par fluorescence X. (I) Conditions théoriques de dosage. **(The determination of trace elements in plants by means of fluorescence X analysis. I. Theoretical conditions of analysis.)** [English, German and Russian summaries ½ p. each.] *Ann. agron.*, 1964, **15**: 651-66, bibl. 12.

The determination of Mn, Fe, Cu and Zn.

6977. Delas, J.
Spectrophotométrie de flamme en milieu oxine. Application aux dosages du calcium et du magnésium dans les sols et les végétaux. **(Flame spectrophotometry in an oxine medium: its application to the determination of calcium and magnesium in soils and plants.)** [English, German and Russian summaries ½ p. each.] *Ann. agron.*, 1964, **15**: 633-49, bibl. 20.

The method described.

6978. Słuzewska, L.
Spectrophotometric determination of selenium in plant material. [Polish?] *Roczn. państ. Zakł. Hig.*, 1964, **15**(3): 303-10, from *Analyt. Abstr.*, 1965, **12**, Abstr. 3412.

6979. Oelschläger, W.
Bestimmung von Selen in biologischen Substanzen. **(The determination of selenium in biological material.)** [English and French summaries ¼ p. each.] *Landw. Forsch.*, 1965, **18**: 79-88, bibl. 24.

6980. Bartel, E. E., and Laker, M. C.
Recovery of zinc from plant material. [Afrikaans and French summaries ¼ p. each.] *S. Afr. J. agric. Sci.*, 1965, **8**: 183-9, bibl. 6.

None of the dry-ashing procedures tested gave satisfactory results, but wet digestion resulted in complete recovery of Zn. [See also *H.A.*, 35: 2519.]

6981. Page, E. R.
Micro-determination of zinc and copper in a single digest of small samples of plant material. *Analyst*, 1965, **90**: 435-6, bibl. 3.

When only very small samples of plant material are available it may be impossible to carry out multiple digestions. In the determination of zinc with dithizone it is necessary to remove interfering copper, and a method is proposed in which the separated copper is conserved and determined, a single digest of plant material thus sufficing for both determinations. [Author's abstract.]—Nat. Veg. Res. Stat., Wellesbourne, Warwick.

Machines and other practical equipment.

(*See also* 7269, 7272, 7363, 7366, 7398, 7592, 7638, 8539.)

6982. Calzecchi-Onesti, A., and others.
Le materie plastiche in agricoltura. **(Plastic materials in agriculture.)** *Ital. agric.*, 1965, **102**: 303-437, bibls, illus.

This double number of the journal is almost entirely devoted to articles on plastic materials, the following being of horticultural interest: Plastic materials as aids to agriculture, by A. Calzecchi-Onesti; The nature of plastic materials, by A. M. Sisto; Forcing and protecting vegetables and ornamental plants, by R. Favilli; Sheets and nets for harvesting olives, by U. Dedini; Storing and marketing vegetables and fruit, by G. C. Pratella and A. Cessari; Effective protection against hail, by M. Palieri; Other applications in tree nurseries, by F. Gorini; Irrigation and the success of plastics, by S. Benassai; Mulching, an old practice modernized, by O. Bonfiglioli; From grape harvesting to must and wine transportation, by L. Turri; Greenhouse roses under glass and plastic, by P. Rosati; and Plastic materials and foodstuffs [problems of toxicity], by L. Sacco.

6983. Charlton, G. K.
A tractor-mounted hydraulically operated platform. *J. agric. Engng Res.*, 1965, **10**: 86-8, bibl. 1, illus.

Designed to give access to the upper parts of large orchard trees for inspection of experimental results.

6984. (Vis, H.)
Nieuwe werktent. **(A new work-tent.)** *Fruitteelt*, 1965, **55**: 649, illus.

A large portable plastic shelter is described that can be used by 2 persons for orchard operations such as pruning under bad weather conditions.

6985. Wisskirchen, P.
Bericht über Versuchsanstellungen mit Gartenscheren. **(A report on investigations on garden secateurs.)** *Mitt. ObstbVersuchsringes, Jork*, 1965, **20**: 71-6, illus.
Untersuchungen an Obstbaumscheren. **(Investigations on fruit-tree secateurs.)** *ErwObstb.*, 1965, **7**: 131-3, illus.

A detailed comparison of the performance of 10 commercial types of secateur, with recommendations on desirable qualities.

6986. Utermark, H.
Schnittholzzerkleinerung. **(Pruning-wood shredding.)** *Mitt. ObstbVersuchsringes, Jork*, 1965, **20**: 200-2, illus.

Three types of tractor-drawn beater-cutter machine for use in the orchard.

6987. Holt, J. B., and Bull, D. A.
A comparison of five types of fork lift machine. *J. agric. Engng Res.*, 1965, **10**: 70-7, bibl. 2, illus.

6988. Bourne, M. C.
Studies on punch testing of apples. *Food Technol.*, 1965, **19**(3): 113-15, bibl. 7.

The performance of pressure testers was evaluated by making punch tests on apples with pressure tips mounted in a universal testing machine which draws a force-distance curve for each punch. It is shown that the force increases rapidly with very little deformation until the yield point is reached when the pressure tip begins to penetrate the fruit tissue. Force-distance curves are divided into 3 classes according to the direction the curve takes after passing the yield point, and the implications of these differences are discussed. The suggestion is made that the depth of penetration of the tip should be greatly reduced so as to obtain a consistent measurement of yield point in all pressure tests. Skin on apples is shown to raise the pressure test by adding the shear strength of the skin to the pressure test. The speed of travel of the tip affects the pressure test to only a small degree. [Author's summary.]—Cornell Univ., Geneva, N.Y.

6989. Goldsberry, K. L.
Multiple port air sampling valve. *Colo. Flower Grs' Ass. Bull.*, 1965, No. 182, pp. 3-4, illus.

A description of apparatus developed at Colorado State University for use in sampling for CO_2 concentration in glasshouse atmospheres.

Greenhouses, frames and cloches.

(*See also* 6883, 7307, 7395.)

6990. Meyaard, D. (Meijaard, D.).
Oorzaken van verschillen in bedrijfsuitkomsten in de glastuinbouw. Een bedrijfsvergelijkend onderzoek in het tuinbouwcentrum Berkel en Rodenrijs. **(Causes of differences between the results obtained on different holdings in the glasshouse industry. A comparative investigation at the Berkel and Rodenrijs Horticultural Centre.)** *Stud. landb.-econ. Inst. 's-Gravenhage* **16**, 1965, pp. 57.
Verschillen in bedrijfsuitkomsten in de glastuinbouw. **(Differences between the results obtained on different holdings in the glasshouse industry.)** [English summary ½ p.] *Meded. Dir. Tuinb.*, 1965, **28**: 188-93+summary.

A 2-year investigation was made into the factors affecting profits on 49 intensive glasshouse holdings in South Holland. Considerable differences in heating capacity were apparent between the units grouped together as "predominantly heated glass". Holdings were separated into 3 groups according to the average planting date of their main crop. Late planting was characteristic of holdings with little or no heating; the other 2 groups had similar levels of capital invested in heating, but, because of different standards of management, there was almost a month's difference between planting dates. The yield level was the main factor affecting the margin of profit; early cropping was also generally associated with the highest financial returns, but the quality of the produce had less effect on the holding's income.

6991. Meijaard, D.
De bedrijfsomvang in de glastuinbouw. **(The size of holding in the glasshouse industry.)** *Meded. Dir. Tuinb.*, 1965, **28**: 258-60.

The effects of the size of the unit on production practices and economics were investigated for glasshouse holdings of 2,000 to 14,000 sq. m. of glass in South Holland.

6992. Ministry of Agriculture, London.
Commercial glasshouse construction. *S.T.L. Minist. Agric., Lond.*, **28**, reprinted 1964, pp. 9, illus.

Advice, with diagrams, on the building of new and the reconstruction of old glasshouses.

6993. Cattabriga, D.
Serre economiche in legno. **(Economical wooden-framed glasshouses.)** *Inf. Ortofruttic.*, 1965, **6**: 119-21, illus.

Descriptions of French houses with arched roofs.

6994. Heinrichs, G.
Erfahrungen mit dem Tragluftgewächshaus. **(Experience with the pneumatically supported greenhouse.)** *Dtsche Gärtnerbörse*, 1965, **65**: 195-6, illus.

A big disadvantage of this greenhouse is the air-lock chamber with 2 narrow doors, one of which must always be closed. Because of this, the use of machinery within the house is limited. An emergency power supply must also be installed to ensure against deflation.

6995. Ruthner, O.
Wege zur industriellen Pflanzenproduktion. **(Methods for the industrial production of plants.)** [English summary 7 lines.] *Bodenkultur*, 1964, **15**: 301-10, illus.

Many hundred thousand plants were grown over a 6-month period in a 42-m. high Ruthner tower glasshouse, erected for the 1964 International Horticultural Exhibition in Vienna. The 3-dimensional, fully automated system, with its continuously revolving assembly line to which the pots are attached, can be adapted to local requirements and allows the mass production of high quality crops, with an optimum nutrient content, at all times of the year in any geographical location. Its advantages over the conventional type of glasshouse are listed. [See also *H.A.*, 34: 2113.]

6996. Halden, W.
Über den Einsatz von Turmgewächshäusern in Industriegebieten. **(The erection of tower glasshouses in industrial areas.)** [English summary 10 lines.] *Bodenkultur*, 1965, **16**: 6-8.

For the production of fresh vegetables throughout the years as a contribution to human health and nutrition.

6997. van den Muijzenberg, E. W. B.
Einige Probleme des Turmgewächshauses. **(Some problems of the tower glasshouse.)** [English summary 6 lines.] *Bodenkultur*, 1965, **16**: 1-5, bibl. 5.

Including mechanization of operations, control of climate and economics.

6998. Kopetz, L. M.
Entwicklungsphysiologische Grundlagen der Pflanzenproduktion im Turmgewächshaus. **(The developmental physiological basis for plant production in the tower glasshouse.)** [English summary 9 lines.] *Bodenkultur*, 1964, **15**: 311-16, bibl. 3, illus.

Plant species with different photoperiodic requirements cannot be growth together in the same tower glasshouse.

6999. (Carpenter, W. J., Jr., and Burkhardt, C. C.)
Color plastic panel growth effect studied. Reprint from *Flor. Rev.*, 1965, **136**(?): 44, 107, illus.

Numerous ornamental flower and foliage plants were grown under greenhouse panels of clear, white, yellow and dark green plastic. Dark green plastic gave very poor results in all cases; white was suitable only for foliage plants during the summer months and for plants such as saintpaulias with low light requirements. Clear plastic was ideal throughout the year (provided ventilation was adequate in hot weather) for plants with high light requirements, and gave good results with almost all other plants over shorter periods. Yellow plastic proved almost as satisfactory for a wide range of plants. [For earlier work see *H.A.*, 32: 142.]—Kans. St. Univ.

7000. Nielsen, V.
Klimaregulering of væksthuse. **(Regulation of glasshouse climate.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 273-8.

The control of light, temperature, humidity, air circulation and water supply is reviewed.

7001. (National Greenhouse Manufacturers' Association.)
Heat loss formula. Reprint from *Flor. Rev.*, 1965, **136**(3520): 94-5.

For use in calculating heat losses in glasshouses.

7002. Shipway, G. P.
Warm air heating of glasshouses. *Agriculture, Lond.*, 1965, **72**: 238-42, illus.

A survey is made of the non-ducted, high-level ducted and low-level ducted systems of warm-air heating, and these are also compared with high-speed, hot-water pipe heating. It is concluded that non-ducted direct-fired air-heating is economical for small units with a low temperature rise requirement over a short period, and that low-level ducted systems are suitable for glasshouses of up to ¼ acre in extent with a heat loss of less than 500,000 B.t.u. per hour.—N.I.A.E., Silsoe.

7003. Roer, P.
Varmeavgivelse fra varmerør i veksthus. **(Heat transfer from heating pipes in the glasshouse.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 281-4.

On the basis of calculations presented it is shown that heat is released both by convection and by radiation. In a cropped house there is a 'radiation balance' between the plants and the environment.

7004. Boodley, J. W.
Heating plastic greenhouses. Reprint from *Flor. Rev.*, 1965, **136**(3520): 49-50, 108-9, bibl. 2, illus.

Calculation of heat requirements and types of heater.

7005. Walker, J. N.
Automatic heat and vent unit developed at Kentucky. Reprint from *Flor. Rev.*, 27 August, 1964, Vol. **135,** pp. 2, illus.

Further details of glasshouse equipment [see also *H.A.*, 34: 4076 and *H.A.*, 35: 261.]

7006. van Gemeren, P.
Ventilation is only half understood. *Grower*, 1965, **63**: 819-20, 822, illus.

The basic patterns of air movement in a glasshouse are shown for 12 different ventilator positions, and automatic systems of ventilation control are briefly discussed. —Inst. TuinbTech., Wageningen.

7007. Curth, P., and Pinkernelle, W.
Konstruktion und Erprobung einer vollautomatischen Koksmattenkühlungsanlage für Gewächshäuser. **(The construction and testing of a fully automatic coke-pad cooling apparatus for greenhouses.)** [Russian and English summaries ½ p. each.] *Arch. Gartenb.*, 1964, **12**: 593-7, bibl. 3, illus.

Constructional details.

7008. Desarzens, A. F.
L'ombrage automatique des cultures horticoles sous verre. **(The automatic shading of horticultural crops under glass.)** *Rev. hort. Suisse*, 1965, **38**: 160-3, illus.

The methods outlined include the use of metal and plastic shutters and films of coloured water. The use of Thermex special glass, which becomes opaque at a predetermined temperature, is described in more detail.

7009. Christensen, S. A.
Skyggemidler for væksthuse. **(Shading materials for glasshouses.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 278-81.

A shorter version of work abstracted in *H.A.*, **34**: 4078.

7010. Nakahara, M., and Minohara, Y.
The effect of a heat-insulating layer in the electric hot-bed. (Preliminary report.) [Japanese, with English summary ⅓ p.] *Tech. Bull. Fac. Hort. Chiba*, 1964, No. 12, pp. 5-10, bibl. 4, illus.

Daily observations on the soil temperature in frames at various levels showed that the soil was more efficiently heated under an insulating layer of polystyrene foam strips than under a layer of straw.

7011. Fukala, E.
Větrání pařenišť. **(Ventilation of hot beds.)** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 185-94, bibl. 6, illus.

A system is described for the thermostatically controlled, hydraulically operated opening and closing of frames.

7012. Mücke, K.-H.
Plastiktunnel begünstigt die Intensivierung des Gartenbaus. **(The plastic tunnel promotes intensification of horticulture.)** *Dtsche Gärtnerbörse*, 1965, **65**: 229-31, illus.

The advantages of the tunnel are its moderate price and low maintenance costs. Frost protection can be increased by using double sheets. The use of double brackets or a clamp has improved its wind resistance.

Storage.

7013. Pieh, K.
Kühlung von Obst und Gemüse. **(Cooling of fruit and vegetables.)** *Dtsche GartenbWirt.*, 1965, **13**: 136-40.

General aspects of cool storage are discussed. Tabulated data (including temperature and R.H.) are presented for the storage of 17 types of fruit and 30 vegetables.

7014. Duvekot, W. S.
Voorkoelen van groente en fruit. **(Pre-cooling of vegetables and fruit.)** [English summary ⅓ p.] *Meded. Dir. Tuinb.*, 1965, **28**: 202-11 + summary.

Air-, water- and vacuum-cooling systems described.

Composition and nutritional value of plants.

(*See also* 7670, 7865, 7979, 7987, 8098, 8740, 8782.)

7015. Busson, F.
Plantes Alimentaires de l'Ouest Africain. Étude Botanique, Biologique et Chimique. **(Food Plants of West Africa. A Botanical, Biological and Chemical Study.)** Imprimerie Leconte, Marseilles, 1965, 10½×7½ in., pp. 568, bibls, illus., F. 100-120 according to binding.

The author is a chemist with the rank of colonel in the medical branch of the French military forces, and his book is a botanical, biological and chemical study of the food plants (in the widest possible sense) of tropical West Africa, the region lying between 5° and 20° N. and bounded on the west by the Atlantic Ocean and on the east by Cameroon and the Chad basin. Its object is to supply fundamental data for further research in this region where the full possibilities of food production are far from being realized.

Chapter I (24 pp.) deals with the physical environment, including geology, relief, climate, soils and hydrography, and is supported by a geological map and diagrams explaining the wind and rainfall regimes of the region. Chapter II (49 pp.) discusses the biological background, namely, the vegetation, which ranges from dense tropical forest in the south coastal area to wooded savannah in the north, and the human population, including their methods of farming and farm implements, and crop geography (roots, rhizomes, tubers and starchy fruits in the forest zone and cereals with some leguminous crops in the savannah). In the short third chapter (8 pp.) the author briefly mentions the analytical techniques which he has used, and discusses the determinations of major and trace elements, lipids and proteins which he provides.

Chapter IV (433 pp.) forms the main part of the work, and its most important content is a large number of chemical analyses of botanical material. The author has cast his net as widely as possible, and appears to have included every plant of whose use as food he has any information at all. Thus he mentions many plants which are quite minor sources of food and of which he provides no chemical information, for example, the Saharo-Sahélien shrub, *Salvadora persica*, whose leaves are used for sauces and for the preparation of cooking salt. The full data, given for plants which are major sources of food, consists of the vernacular names and a brief botanical description supported by line drawings or photographs, original habitat, habitat in West Africa, culture, the alimentary uses of the plant and chemical analyses of the parts which form the articles of diet. Information is provided about plants of over 200 genera (many with several species) belonging to some 70 families. Chapter V (11 pp.) discusses the origin, nature and evolution of the diet provided by plants.

There are over 200 illustrations, mostly consisting of splendid line drawings of flowers, fruit and foliage. The drawings come from a number of sources, including Hutchinson and Dalziel's Flora of West Tropical Africa, but unfortunately not all of them carry an indication of the scale; those of Mademoiselle Helène Lamourdedieu of the Muséum d'Historie Naturelle are outstandingly clear and delicate. There are a few colour photographs which range in quality from a fine picture of a fisherman in a canoe on the Niger (he is casting a net into the river in order that he may supplement the protein-deficient diet supplied by the food plants of West Tropical Africa with the flesh of a Niger perch) to a basket of undersized and rather unappetizing mangoes. The numerous bibliographical references are at the bottoms of the pages in which they are mentioned. At the end of the book there are indexes of authors, of the plants illustrated and of the botanical, common and vernacular names of all the food plants discussed. The paper, the printing and the binding in a pliable black cover are good.

Much time and loving care have obviously gone into the preparation of this book, and the publication of the author's numerous analyses will be of unquestionable value to the specialist, but the mere fact that the leaves of a relatively unimportant plant are used, for example, in the preparation of sauces is surely of rather limited interest, and not all of his botanical and other supporting material is new. In the preface to this book the Director of the Centre National de Coordination des Études et Recherches sur la Nutrition et l'Alimentation reminds us that the chief lack in the diet of the population of tropical West Africa is protein. This will only be cured, and the spectre of famine and malnutrition will only be driven into the limbo, when there is a revolution in farming methods. The revolution must consist basically of a great expansion of animal husbandry and of the cultivation of leguminous crops, and of the adoption by farmers of rotational and manurial practices and farming implements which will permit the replacement of shifting cultivation by effective permanent agriculture producing high and regular yields. If they help to forward this revolution, the analyses of food crops contained in Colonel Busson's book will be a valuable aid to West African agriculture. J.D.

7016. Schuphan, W.
Die Qualität der Ernteprodukte. Biochemische Qualitätsprobleme. **(The quality of crop products. Problems of biochemical quality.)** *K. Skogs- LantbrAkad. Tidskr., Stockh.*, 1965, **104**: 173-207, bibl. 33, illus.

Factors affecting the quality and nutritional value of the harvested crop are discussed, spinach and cereals being used as examples. [See also *H.A.*, 35: 4941.]

7017. de Bruyn, J. W.
Chemisch onderzoek ten behoeve van de veredeling. Voortgangsrapport I.V.T. 1952-1964. **(Chemical research for the benefit of breeding. Progress report I.V.T. 1952-1964.)** [English summary ½ p.] Reprint from *Landb. Doc.*, 1964, **20**(42/43 and 47), being *Meded. Inst. Vered. Tuinbouwgew. Wageningen* **227**, 1964, pp. 24, bibl. 38, illus.

The crops investigated included vegetables (carrots, cucumbers, onions, beetroot and celeriac), soft fruits, apples, numerous drug and essential oil plants, roses and tobacco. The most important findings on nutritional value and contents of active principles are summarized.

7018. Murti, V. V. S., and Seshadri, T. R.
Toxic amino-acids of plants. *Curr. Sci.*, 1964, **33**: 323-9, bibl. 87.

A review.

Books.

(*See also* 6877, 7015, 7107, 7292, 7667, 7885, 8217, 8939.)

7019. Akenhead, D. (Compiler).
The Annals of Applied Biology. Index to Volumes 1-50. Cambridge University Press, London, 1965, 10×7 in., pp. 228, 40s.

In view of the large number of papers from the *Annals of Applied Biology* that have been abstracted over the years in *H.A.*, we are glad to be able to draw the attention of our readers to the appearance of a cumulative index to the first 50 volumes, dating from 1914 to 1962. This consists of an Index of Authors, giving the titles of the papers contributed by each, and a most explicit and helpful Index of Subjects. To anyone who assumes that the compilation of an index is a purely mechanical process, the Introduction may be a revelation; it will certainly afford better entertainment than one could dare to hope for in the pages of such a learned work. It is evident that a vast amount of care and common sense has gone into making this index both reliable and simple to use.

7020. Esau, K.
Plant Anatomy. John Wiley & Sons, Inc., New York, London, Sydney, 2nd Edition, 1965, 9×6 in., pp. xx+767, bibls, illus., 105s.

Much water has flowed under scientific bridges since the first edition of Professor Esau's book appeared in 1953 [see *H.A.*, 23: 3632]. All the excellent features of the former edition have been retained, and the results of recent ultra-structural research have been incorporated, both in the text and in the illustrations, especially in the chapters on the protoplast, the cell wall and meristems. The increasing interest among botanists in the relation of meristematic structure to function is amply reflected here. Chapter 13, formerly concerned only with laticifers, has been considerably expanded to include other secretory structures, external as well as internal, and the number of plates at the end of the book is increased from 86 to 95. The expansion of the list of contents to include sub-headings of chapters is a useful innovation. The price may appear high, but the book is of outstanding excellence. K.C.

7021. Little, E. L., Jr., and Wadsworth, F. H. **Common trees of Puerto Rico and the Virgin Islands.** *Agric. Handb. U.S. Dep. Agric.* **249**, 1964, 10½×8 in., pp. 548, bibl. 42, illus., $4.25.

Detailed descriptions and illustrations are given of 250 species. There are also special lists of poisonous trees and trees with striking growth characteristics, coloured sap or latex and distinctive leaves, flowers or fruit.

Annual reviews, yearbooks and directories.

7022. Commonwealth Economic Committee. **Fruit. A review of production and trade relating to fresh, canned, frozen and dried fruit, fruit juices and wine.** [*Publ.*] *Commonw. econ. Cttee*, H.M.S.O., London, 1965, pp. 245, 10s.

Data on the major fruits of the world.

7023. Horticultural Education Association. *Scientific Horticulture, Vol. 17, 1964-65.* Gibbs and Sons, Ltd, Orange St., Canterbury, Kent, [1965], 9½×6 in., pp. 174, bibls, illus., 25s.

This volume, marking the Diamond Jubilee year of the H.E.A., is impressive in both size and number of illustrations. It contains the 11 papers read at the symposium held in 1963 on the effects of wind and shelter in horticulture, including the following: Glasshouse heating and ventilation in relation to wind and shelter, by L. G. Morris; Some effects of wind upon vegetable crop plants, by E. J. Winter [abstracted separately]; Report on work at Experimental Horticulture Stations with shelter screens, by W. H. Hogg [see *H.A.*, 33: 774 and 35: 3516]; The wind factor in orchard tree spacing, by A. P. Preston [abstracted separately]; The effect of shelter on the distribution of insect pests, by T. Lewis; The provision of living and artificial shelter, by F. W. Shepherd [see also *H.A.*, 33: 17]; and Ornamental horticulture in exposed situations, by J. R. B. Evison. Papers read at H.E.A. conferences include: The future of the glasshouse industry, by W. J. C. Lawrence; The role of uncultivated land in the biology of crop pests and beneficial insects, by H. F. van Emden; Plants and light, by A. E. Canham; and Plants and temperature, by J. V. Lake. There is also an interesting report on The morphology of a *Streptocarpus* hybrid [Constant Nymph] and its regeneration from leaf cuttings, by M. E. Marston [see also *H.A.*, 33: 3362]. Finally there is a selected list of recent books on horticulture and cognate sciences.

7024. Machlis, L., and Briggs, W. R. (Editors). *Annual Review of Plant Physiology. Vol. 16.* Annual Reviews, Inc., Palo Alto, Calif., 1965, 9×6 in., pp. 493, bibls, $8.50 (U.S.A.) or $9.00 (elsewhere).

Among the 20 reviews comprising this volume are the following: Some problems of amino acid and amide biosynthesis in plants, by W. L. Kretovich; Enzymology of energy conversion in photosynthesis, by A. San Pietro and C. C. Black; Respiratory electron transport, by M. Lieberman and J. E. Baker; Low molecular weight phenols in higher plants, by J. B. Pridham; Biochemical aspects of plant polysaccharides, by J. H. Nordin and S. Kirkwood; Dynamic aspects of soil-water availability to plants, by W. R. Gardner; The penetration of growth regulators into leaves, by J. A. Sargent; Ion absorption and transport in plants, by R. Brouwer; The analysis of interactions of physical and chemical factors on plant growth, by J. A. Lockhart; Stereoisomerism in plant growth regulators of the auxin type, by A. Fredga and B. Åberg; Stem elongation, by R. M. Sachs; Physiology of flowering, by N. E. Searle; Plant cell differentiation, by L. Stange; Physiological effects of gibberellins, by L. G. Paleg; and Properties of phytochrome, by H. W. Siegelman and W. L. Butler.

7025. New York State Horticultural Society. *Proceedings of the 110th Annual Meeting of the New York State Horticultural Society, 1965,* [1965], Vol. **110**, pp. 296, bibls, illus.

Contributions include research reports, observations and growers' experience on the following subjects: fruit and vegetable marketing, fruit tree irrigation, mechanical harvesting of cherries and apples, gas storage of fruit, apple varieties, growth retardants for apples, fruit pest and disease control, bird control, vine training, pruning and varieties, elderberry culture and varieties and strawberry culture. Some of the papers have been abstracted separately in this number of *H.A.*

7026. Sennels, N. J., and Villtoft, H. (Editors). *Årbog for Gartneri, 1964, 46 Årgang.* (**46th Danish Horticultural Yearbook, 1964.**) Alm. Dansk Gartnerforening, København, [1965], pp. 193, illus.

The yearbook follows the same form as usual, containing extensive information on horticultural organizations, market statistics and reports from the various sections of the Danish Horticultural Association. These last include reports on variety trials with saxifrages and astilbes [see *H.A.*, 35: 1441 and 3788] and with cabbages, brussels sprouts, spinach (overwintered outside), lettuces (in heated glass in winter) and radishes (in a cold frame). The research reports deal with the following subjects: the application of micro-nutrients to celeriac; spacing of cucumbers; hormone treatment for fruit setting on tomatoes; growing cucumbers on straw and peat bales; control of cucumber diseases; and casing materials for mushrooms. Research results on *Asparagus plumosus* and pot plants have been abstracted separately in this number of *H.A.*,

7027. Tysser, H. F. (Editor). *The Fruit Annual 1965.* British-Continental Trade Press, Ltd, 222 Strand, London, [1965], 9½×6½ in., pp. 582, illus., 40s.

As well as a comprehensive directory section and a survey of world trade in fruit, this yearbook contains reviews on present trends in fruit packaging and handling methods and on progress in the air transport of produce. Other items are a 5-language dictionary of trade terms, a fruit supply calendar, lists of trade organizations and specialized journals and a guide to shipping.

7028. WASHINGTON STATE HORTICULTURAL ASSOCIATION.
Proceedings of the 60th Annual Meeting of the Washington State Horticultural Association, 1964, [1965], pp. 235, bibls.

In addition to brief surveys on fruit growing in Argentina and Germany, these Proceedings contain review articles and discussions on recent developments in tree fruit culture, including irrigation, frost protection, spray compatibility and injury, biological and integrated pest control, insect control by the sterile male technique, methods of determining apple maturity, marketing and Red Delicious sports. Papers on the use of growth retardants on fruit trees and on cherry rootstock trials have been abstracted separately.

Reports from temperate countries.

7029. BRITISH COLUMBIA.
59th Annual Report of the Department of Agriculture, 1964, 1965, pp. 18, illus.

Horticulture (pp. 13-15): The use of live female codling moths in traps; apple scab and coryneum blight studies; winter storage of strawberry plants; variety trials on small fruits; variety and cultural trials on grape vines; and vegetable variety trials.

7030. CENTRUM VOOR PLANTENFYSIOLOGISCH ONDERZOEK, WAGENINGEN.
Jaarverslag 1964. **(Annual Report of the Centre for Plant-physiological Studies, Wageningen, for 1964),** [1965], pp. 33.

The following are among the research projects reported: Breaking dormancy of spinach, phlox and *Alstroemeria* seeds with growth substances (gibberellic acid and tocopheryl acetate); the use of the growth inhibitor B-9 to shorten the juvenile phase of apples, to reduce the vigour of apples, and to counteract the reduction of flower formation of pears caused by GA sprays used to induce parthenocarpy; the effect of herbicides (amitrole and urea compounds) on the biosynthesis of chlorophyll in cress; nitrogen-carbohydrate metabolism in tomatoes; translocation of assimilates and biocides in *Yucca flaccida*; studies on grafted cucumbers; growth-substance studies on higher plants (coleus); and the effect of TIBA on Ca translocation in tomatoes.

7031. COLORADO.
75 years of Agricultural Research in Colorado, being *75th Annual Report of the Colorado Agricultural Experiment Station, 1961-62,* [1964], pp. 16, illus.
Agricultural Research in Colorado, being *76th Annual Report of the Colorado Agricultural Experiment Station, 1962-1963,* [1965], pp. 19, illus.

Projects and publications listed.

7032. C.S.I.R.O., AUSTRALIA.
Plant Industry, 1963-64, being *Annual Report, Division of Plant Industry, 1963-64,* 1964, pp. xxvii+227, illus.

Genetics and Plant Breeding (pp. 1-28): Tobacco breeding for resistance to blue mould. *Microbiology* (pp. 41-62): Studies on the reactions of tobacco to *Peronospora tabacina*; studies on the phytoalexins of *Phaseolus* beans, broad beans and peas; effects of pre-inoculation and post-inoculation heat treatments on the development of lesions of tobacco mosaic virus. *Plant Nutrition* (pp. 75-84): Protein synthesis in cell-free extracts of tobacco leaves. *Biochemistry* (pp. 85-96): The chlorophyll-protein complex of spinach chloroplasts; studies on tobacco mosaic virus. *Plant Physiology* (pp. 97-106): Studies on substances inducing cell division in plant cells, including the kinins of apple extract and of coconut milk. *Ceres* (pp. 107-16): The susceptibility of bean plants to virus infection; the effects of temperature, light intensity and water stress on cuticle development in cauliflowers; temperature limits for growth in tomatoes; photoperiodic control of flowering in peas. *Fruit Investigations—Tasmania* (pp. 207-10): Physiology of apple fruits in relation to storage disorders. *Tobacco Investigations—Mareeba* (pp. 211-22): Diurnal and developmental changes in tobacco leaf starch; relative influence of environment and nutrient level on growth of tobacco plants, leaf dry weight and nitrogen content; oxidative enzymes and phosphate esters in relation to senescence of the tobacco leaf; isolation and identification of a pink fluorescent compound in tobacco leaves; polyphenol patterns in relation to inheritance of blue mould resistance; hardening of seedlings; restriction of water following transplanting; translocation of assimilates; apical development; vascular system studies; flat leaf investigations; N uptake; and the mineralization of soil N.

7033. DEPARTMENT OF AGRICULTURE AND FISHERIES FOR SCOTLAND.
Agricultural Statistics 1963, Scotland, H.M.S.O., Edinburgh, 1965, pp. 84, 9s.

Acreages, production figures and prices.

7034. DEPARTMENT OF AGRICULTURE AND FISHERIES FOR SCOTLAND.
Agriculture in Scotland: Report for 1964, H.M.S.O., Edinburgh, 1965, pp. 96, 7s.

Information on horticulture negligible.

7035. EAST MALLING.
Annual Report of East Malling Research Station, 1964, 1965, **A48**, pp. xxiv+212, bibls, illus., 17s. 6d. or $2.50 post free.

A general review of current research work with lists of papers published during 1964 is followed by the major part of the report headed *Research reports and reviews* (pp. 44-195). Most of these papers have been abstracted separately. The remainder include the 17th Amos Memorial Lecture on the subject 'Research and education in a new university', by G. Templeman, the Vice-Chancellor of the University of Kent; Cytological notes. II. *Ribes*, by E. Keep [for part I see *H.A.*, 28: 2158]; and Forty years of weather at East Malling, by G. F. Trowell. *Bulletins for fruit growers* (pp. 196-208) include Field trials with M.26, by A. P. Preston; Spindlebushes of Laxton's Superb and Laxton's Fortune on M.26 at East Malling, by B. F. Seymour; A trial of tree ties, by E. M. Glenn; and Progress in research in 1964, by B. F. Self.

7036. EDINBURGH SCHOOL OF AGRICULTURE.
Experimental Work, 1964, 1965, pp. 79, 7s. 6d.

Roots (pp. 24-5): Plant population studies in swedes. *Horticultural Crops* (pp. 26-30): Cauliflower variety trial; carrot storage; trials of 2 organic tin compounds as pre-planting root dips for clubroot control on cabbages;

raspberry and strawberry pollination studies; strawberry variety trial; defoliation of roses. *Weeds* (pp. 44-7): Weed control in swedes.

7037. GEISENHEIM.
Bundesanstalt für Qualitätsforschung pflanzlicher Erzeugnisse in Geisenheim/Rheingau. Jahresbericht 1963. **(Annual Report of the Federal Institute for Quality Research in Plant Products, Geisenheim, for 1963)**, [1964?], pp. 22.

Research is reported on the following subjects: The correlation between rainfall and yields in *Brassica* spp.; the relationship between N manuring, protein content and protein quality in leafy vegetables; factors affecting the carotene content of carrots; variety trials on carrots, peas, beans, tomatoes, spinach, paprikas, leeks and apples; the organic acid contents of strawberries, red and black currants, apples, mirabelle plums, Schattenmorelle cherries and citrus fruits; the effect of variety and manurial treatment on the biological value of vegetables; insecticide residues in carrots; the effect of the herbicide linuron on the carotene content of carrots; the effect of storage on the nutritional value of leafy vegetables; the effects of locality and cultural practices on the need for chemical control of the onion fly; a comparison of the sugar, carotene and ascorbic acid contents of loose and tight brussels sprouts; the ascorbic acid content of lettuces harvested at different times of day; the content of phenolic substances in spinach and lettuces watered with distilled water, mains water and phenol solutions.

7038. MACAULAY INSTITUTE FOR SOIL RESEARCH.
Annual Report No. 34, 1963-1964, pp. 55.

Plant Physiology (pp. 35-6): Changes in organic acids in leaves in relation to mineral metabolism; the nitrate and ammonium nutrition of plants; ion transport and electrical potentials in red beet cells; cell water relations.

7039. MICHIGAN STATE UNIVERSITY.
Research is for people. [*Publ.*] *Mich. agric. Exp. Stat.*, 1965, pp. 17, illus.

Among the 35 current research projects briefly cited are: Mechanical harvesters for cherries, blueberries and tomatoes; control of Japanese beetle in lawns; breeding tomatoes, celery and cabbages; prediction of the optimum planting and harvesting dates for cucumbers; and mist irrigation of cabbages and lettuces to reduce transpiration.

7040. MINNESOTA.
Seventieth Annual Report of the Agricultural Experiment Station, University of Minnesota, July 1, 1962, to June 30, 1963, 1964, pp. 48.

Publications and new projects listed.

7041. MISSISSIPPI.
77th Annual Report of the Mississippi Agricultural Experiment Station for the fiscal year ending June 30, 1964, pp. 110, illus.

Agronomy (pp. 12-22): Turf establishment and fertilizer trials; packaging and storage of vegetable seeds. *Entomology* (pp. 30-3): Hickory shuckworm control on pecans. *Horticulture* (pp. 38-44): Breeding and varieties of pears, blackberries, raspberries, peaches, plums, strawberries, apples, vines, cucumbers, tomatoes and collards; rest period studies on tung trees; herbicide trials in peach, pear and pecan orchards; cultural and nutritional trials on 4 peach varieties; foliar nutrition of pecans; new films for plastic greenhouses; factors affecting the development and maturity of watermelon fruits, and the relationship between the chronological and physiological age of the melons; the effect of pH and fertilizer rate on the yield and mineral content of shelled lima and snap beans; a comparison of naturally cooled and refrigerated Easter lily bulbs; container media for shrubs. *Plant Pathology and Weed Science* (pp. 44-9): The selection of bell and pimento peppers for resistance to tobacco mosaic virus and root-knot nematodes; control of peach scab; fungicide trials on pecans; aerial applications of fungicides to pecans; control of mimosa wilt; chemical weed control in sugar cane, peaches, pears and pecans. *Coastal Plain Branch Station* (pp. 60-3): Muscadine vine and pear variety trials. *Delta Branch Station* (pp. 63-78): Castor bean breeding and weed control. *North Mississippi Branch Station* (pp. 80-2): Strawberry, apple and pear variety trials. *South Mississippi Branch Station* (pp. 86-8): Tomato, sugar cane and turfgrass variety trials; tung breeding, control of leaf spot, mechanical harvesting, irrigation and the use of growth substances to delay flowering. *Truck Crops Branch Station* (pp. 88-91): Variety trials on peas, snap beans and lima beans for once-over harvesting and processing; tomato, cabbage, bell pepper and watermelon variety trials; breeding of cabbages, cauliflowers and turnips; transplanting dates, spacing, black plastic mulching and clear plastic plant covers for lettuces; fertilizer trials on greenhouse tomatoes and watermelons; a comparison of peat pots and bagasse pots for raising watermelon, cucumber and squash plants; the control of tomato diseases and pests.

7042. NEBRASKA.
78th Annual Report of the Nebraska Agricultural Experiment Station, 1964, 1964, pp. 39.

Research projects and publications listed.

7043. NOTTINGHAM UNIVERSITY.
Report of the School of Agriculture, 1964, 1965, pp. 132, bibls, illus.

Research in the School of Agriculture (pp. 21-41): The role of B in growth-substance metabolism in root tips of *Vicia faba*; the influence of various water potentials on pea seed germination; the development of *Rhizoctonia* in populations of tomato seedlings; the effects of irrigation on the yields of horticultural crops; the combined effects of weather factors on seed germination and subsequent plant growth; the effects of soil conditions on the growth of lettuces sown at different times; the interaction between soil temperature and aerial conditions on the rooting of cuttings; the growth and development of lettuce varieties in relation to environmental factors, and the effects of added CO_2 on the growth of lettuces under adverse conditions. A separate article on water requirements for seed germination has been abstracted separately.

7044. PLANT BREEDING INSTITUTE, CAMBRIDGE.
Annual Report 1963-64, 1965, pp. 111, illus., 5s. 6d.

New equipment (pp. 104-8): A ventilator control unit designed to regulate temperature in glasshouses is described.

7045. PROEFBEDRIJF DER NOORDERKEMPEN, MEERLE.
Jaaverslag 1963-1964. **(Annual Report for 1963-1964 of the Experimental Farm at Noorderkempen, Meerle [Belgium])**, pp. 112.

Cultural trials reported include the following: strawberry variety trials in the open and under glass, time of planting, control of diseases and weeds; raspberry variety trials and pest and disease control; red currant variety trials, training and pruning, and pest and disease control; blueberry variety and cultural trials; cherry pruning; gherkin variety trials, growing on wires, disease control, growing under glass; asparagus variety trials, weed control; brown bean (*Phaseolus*) variety trials, weed control; brussels sprouts variety trials. Investigations into farm economics include production costing for strawberries, gherkins, beans, red and black currants and raspberries.

7046. ROTHAMSTED (LAWES AGRICULTURAL TRUST).
Report of the Rothamsted Experimental Station for 1964, 1965, pp. 375, bibls, 15s.

Chemistry Department (pp. 39-72): Carrot yield responses to NK, NPK and FYM; globe beet seed-bed compaction and soil conditioning with rubber latex; cabbage spacing; slow-release fertilizers for conifer seedlings; P sources for swedes. *Soil Microbiology Department* (pp. 85-97): Succinate metabolism in pea root nodules; tomato responses to *Azotobacter* inoculation of seedlings. *Botany Department* (pp. 98-114): Photosynthesis in detached rooted bean leaves; betaines (quaternary ammonium compounds) in beet and beans; sugar accumulation in virus-infected plants, including carrots. *Biochemistry Department* (pp. 115-25): Tobacco chloroplasts, mitochondria and polyphenoloxidase activity; oxidative deamination and decarboxylation of amino acids by pea and bean seedling extracts; presence of amine oxidases in beans and *Lonicera periclymenum*; extraction and preparation of leaf protein for human food; physiology of infection by tobacco mosaic virus. *Plant Pathology Department* (pp. 126-42): Studies on cucumber mosaic and carrot motley dwarf viruses, and aphid transmission of the latter; studies on the nematode-transmitted viruses causing pea early browning and tobacco rattle; transmission of tobacco necrosis virus by the fungus *Olpidium brassicae*; control of pea wilt (*Fusarium oxysporum* f. *pisi*) by chitin. *Nematology Department* (pp. 143-55): Nematode parasitism of the mushroom compost fly, *Bradysia paupera*; hot water control of *Ditylenchus dipsaci* in narcissus bulbs; the effect of plant density on populations of pea cyst-nematodes (*Heterodera göttingiana*); biology of cabbage cyst-nematodes (*H. cruciferae*). *Insecticides and Fungicides Department* (pp. 156-76): Toxicity of insecticides to bees; effects of spray particles on leaves of beans and *Coleus blumei*. *Entomology Department* (pp. 177-94): Slug control. *Bee Department* (pp. 195-202): Increase of bee visits and reduction of fruit set by spraying broad beans and apple trees with sugar syrup; bee pollination of the apple varieties James Grieve and Cox; lack of response of 7 black currant varieties to cross-pollination; increased yield and earliness of the broad bean seed crop due to bee pollination; solitary bees (*Andrena flavipes*) as fruit tree pollinators. *Woburn Experimental Station* (pp. 246-52): Nutrition of leeks, globe beets and carrots; and carrots in a ley-arable rotation.

7047. TATURA HORTICULTURAL RESEARCH STATION, VICTORIA.
Annual Research Report, 1963-64, pp. 51.

Block Reports (pp. 1-8): Peach fertilizer, pruning, thinning, soil management, irrigation, variety and rootstock trials; pear soil management, fertilizer and rootstock trials; apple rootstock and pruning trials. *Pomology* (pp. 9-15): Chemical thinning of peaches; limb topping of aged peach trees; crop loading and fruit growth of peaches; replacement peach trees on plum rootstocks; pear fruit setting in relation to yield; pollination of Packham pears; prediction of the harvest date for Williams' pears; pear pruning trials; chemical thinning of apples; pre-harvest drop of Jonathan apples; pear pollination by bees. *Fruit Quality* (pp. 16-21): Fruit characteristics of peach varieties; heat ripening of cling peaches; N, K, Ca and Mg fertilizers in relation to peach fruit quality; rootstocks in relation to peach fruit quality; N fertilizers in relation to fruit quality of Williams' pears. *Soil Physics* (pp. 22-7): Pot and laboratory studies on moisture usage and root efficiency of peach seedlings; soil characteristics in relation to peach tree waterlogging; soil properties in relation to peach and pear tree vigour; root distribution of peach and pear trees; vertical mulching of peach trees; treatment of waterlogged peach trees; peach root growth in surface soils. *Nutrition and Physiology* (pp. 28-33): Storage N in young peach trees; peach bud and fruit development in relation to N; N losses from pear and apple trees; effect of summer N dressing on peaches; autumn N application to apples, pears and peaches; nutritional trial on Williams' pears; bitter pit control in apples; peach nutritional survey. *Plant Pathology* (p. 35): Investigations on pear scab, apple scab and pear blossom blast (*Pseudomonas syringae*). *Entomology* (pp. 36-7): Control of San José scale. *Tomato Trials* (p. 38): Variety and herbicide trials; evaluation of seedling production methods. *Other Special Projects* (p. 39): Herbicide trials in apples and peaches; peach waterlogging; an abnormality of Pullar peach trees (suspected of being due to a virus); a peach fruit grader.

7048. VICTORIA DEPARTMENT OF AGRICULTURE.
Report of the Biology Branch, No. 2, 1962, and List of Publications from January 1961-June 1962, pp. 51, illus., [received 1965].

Applied Mycology (pp. 7-19): Control of brown rot (*Sclerotinia fructicola*) of stone fruits, peach rust (*Tranzschelia pruni-spinosae*), peach leaf curl (*Taphrina deformans*), apple scab (*Venturia inaequalis*), apple target spot (*Gloeosporium album*), apple crown rots (*Phytophthora cactorum* and *Pythium* spp.), apricot gummosis (*Eutypa armeniacae*), pear scab (*Venturia pirina*), pear blossom blast (*Pseudomonas syringae*), peach root rot (*Armillaria mellea*), loganberry dieback (*Elsinoe veneta*), clubroot (*Plasmodiophora brassicae*) and downy mildew (*Peronospora parasitica*) of crucifers, lettuce anthracnose (*Marssonina panattoniana*), parsnip canker (*Itersonilia perplexans*), parsnip leaf spots (*Cercosporella pastinacae* and *Cylindrosporium pastinacae*), celery leaf spot (*Septoria apii-graveolentis*), tobacco blue mould (*Peronospora tabacina*), passion fruit brown spot (*Gloeosporium mollerianum*) and black spot (*Elsinoe amphelina*) and various diseases of turf. *Plant Virology* (pp. 19-28): Virus diseases of apples, pears, peaches, citrus, strawberries, vines, lettuces, capsicums, carrots, chrysanthemums and tobacco. *Plant Nematology* (pp. 29-32): Nematode studies in tobacco, grape vines, beets, carrots, parsnips, apples, cherries, lilies, citrus, roses, turf and mushrooms. *Plant Bacteriology* (pp. 32-3): Bacterial diseases of french beans, tomatoes and lettuces. *Plant nutrition*, (pp. 34-6): Radioactive isotope studies on peaches, zinnias, coleus, cabbages, stocks, broad beans and brussels sprouts; brown rot of peaches in relation to nutrition; B deficiency in apples; internal browning of brussels sprouts; blossom-end rot in tomatoes; B and Ca nutrition of red beet; tip burn of spinach; the effect of N source on growth of zinnias, Iceland poppies and *Nicotiana glutinosa*. *Entomology* (pp. 37-44): Control of codling moth and light brown apple moth on pears, and of oriental fruit moth on peaches; the association of *Tetranychus telarius* with pear leaf scorch; control of woolly aphid (*Eriosoma lanigerum*) on apples, of San José scale (*Quadraspidiotus perniciosus*) and mealy bug (*Pseudococcus adonidum*) on pears, of mealy bug (*Pseudococcus adonidum*) and light brown apple moth (*Epiphyas postvittana*) on vines, of root borer (*Leptopius squalidus*) on apples, of red scale on citrus and of *Pieris rapae* and *Brevicoryne brassicae* on cabbages.

7049. WASHINGTON STATE UNIVERSITY.
1964 Research Progress. *Stats Circ. Wash. St. Univ.* **429**, [1965], pp. 72.

Agricultural Chemistry (pp. 1-6): Biochemical indicators of iris bulb maturity; the use of organo-metallic fungicides on turf and bulbs; herbicide residues in carrots and onions; pesticide residue persistence in pears and apples. *Agricultural Engineering* (pp. 12-14): Control of CO_2 in an air-supported plastic greenhouse; irrigation of peas and beans. *Agronomy* (pp. 15-31): Turfgrass management studies; safflower production under irrigation; hop production; pea nutrition; vegetable fertilizer trials; control of Fe deficiency in pear trees and Zn and Mg deficiencies in apples; strawberry and blackberry fertilizer trials; safflower variety trials; a fertilizer/spacing trial on crambe; Christmas tree fertilizer trial; trials of a nursery planter and cultivator; measurement of the soil water content and water tension near root hairs using isotope techniques. *Entomology* (pp. 42-8): Control of pear psylla, spider mites and San José scale; insect pollination of cranberries; stone fruit virus vectors; control of the black vine weevil on vines, McDaniel mites on stone fruits, strawberry weevils (*Brachyrhinus* spp.), strawberry virus vectors (aphids), dryberry mite on loganberries and raspberry weevils; control of carrot rust fly (*Psila rosae*), and of cabbage maggot (*Hylemyia brassicae*) on radishes, broccoli, turnips and swedes; slug control in rhubarb; the biology and control of symphylans. *Forestry and Range Management* (pp. 49-50): Christmas tree production and marketing. *Horticulture* (pp. 52-7): Stone fruit varieties, hardiness and N nutrition; effects of the growth retardant B-9 on apples, cherries and pears; pear decline studies; pear dieback and blossom blast (*Pseudomonas syringae*); mechanical harvesting of raspberries; small fruit variety trials; pea breeding; curly top resistance in tomatoes; vegetable variety trials; determination of the amount of moisture stress that will cause blossom drop in Romano beans; skin quality in tulip bulbs; chemical weed control in ornamentals; fertilizers for nursery stock in containers; rhododendron nutrition; the effect of light diffusion on the development and photosynthetic efficiency of plant leaves; K deficiency in Concord vines; the effects of CO_2 in the storage atmosphere on pears. *Plant Pathology* (pp. 58-64): Studies on virus and bacterial diseases of fruit trees; the identification and movement of psylla toxin in pear trees; control of onion smut (*Urocystis colchici*), pea root rot, fungus leafspot (*Stemphyllium consortiale*?) and bacterial angular leafspot (*Pseudomonas lachrymans*) in cucumbers, and verticillium wilt in *Cucumis* spp. and peppermint; breeding broccoli resistant to downy mildew; the effect of humidity at various temperatures on the sporulation of the hop downy mildew fungus; control of red stele and root rots of strawberries; the reduction of decay in stored cranberries; disease control in ornamental shrubs, bulbs and turf; nematodes associated with mint.

7050. WISCONSIN.
What's New in Farm Science, being ***Part I of the 8oth Annual Report of Wisconsin Agricultural Experiment Station for the year ending June 30, 1963,*** being *Bull.* **569**, 1964, pp. 76, illus.

Dairy and Foods (pp. 9-23): Harvesting and handling peas for canning. *Special Subjects* (pp. 40-6): Control of damping-off (*Rhizoctonia solani*) of bean plants by nematodes (*Aphelenchus avenae*); studies on non-leguminous N-fixing plants.

Reports from tropical and sub-tropical countries.

7051. C.S.I.R., SOUTH AFRICA.
Twentieth Annual Report of the Council for Scientific and Industrial Research, 1964, 1964, pp. 41, illus.

Research work includes the testing of plant alkaloids for pharmacological properties; improving the filterability of raw sugar; and the sampling of sugar cane as a basis for payment.

7052. HONG KONG.
Annual Departmental Reports by the Director of Agriculture and Forestry, 1963-64, [1964], pp. 87, illus., HK$5.50.

Agricultural Service (pp. 12-22): Tomato and carrot variety trials; tea spacing and variety trials; water-chestnut strains and spacing; citrus environmental and nutrient spray trials; litchi pruning, manuring and control of stink bug (*Tessaratoma papillosa*); guava propagation from cuttings; control of citrus leaf miner (*Phyllocnistis citrella*); control of dry rot of gladiolus corms.

7053. INDIAN COUNCIL OF AGRICULTURAL RESEARCH.
Annual Report of the Indian Council of Agricultural Research for 1961-62, [undated, received 1965], pp. 162.

Mycology (pp. 5-6): Work on betelvine wilt and citrus dieback. *Entomology and animal pests of crops* (p. 6): Control of San José scale and woolly aphid on apples. *Horticulture* (pp. 8-10): Investigations on citrus, mangoes, bananas, guavas, vines and deciduous fruit and nut crops. *Vegetables and floriculture* (pp. 10-11): Studies on tomatoes, onions, chillies, *Curcuma longa* and ornamentals. *Commodity crops* (pp. 11-12): Investigations on cashews, ginger, cardamoms, cacao, turmeric, medicinal plants and essential oil plants. *Commodity Committees* (pp. 26-33): Investigations on areca palms, coconut palms, oilseeds, tobacco, lac and spices.

7054. JORDAN.
Tenth Annual Report, 1961, of the Deir Alla Research Station, [undated, received 1965], pp. 73+xiv.

Much of the report is concerned with cereals and fodder crops. Work of horticultural interest includes chemical control of the safflower fly (*Chestorellia jacae*) (p. 45), and an observational trial on planting dates for sugar cane (pp. 65-6).

7055. KENYA.
Department of Agriculture Annual Report 1962. Vol. I. Report of the Director of Agriculture, 1963, pp. 95, Sh. 5; and ***Idem. Vol. II. Record of Investigations,*** 1964, pp. 215, Sh. 10.

Research work, which is reported in detail in Vol. II, is summarized in Vol. I as follows: *Coffee* (pp. 29-31): Control of *Leucoptera* spp. and *Antestiopsis lineaticollis*; leaf analysis methods and results; control of leaf rust (*Hemileia vastatrix*) and berry disease (*Colletotrichum coffeanum*); the effect of the level of cropping on the carbohydrate content of the plant; varietal resistance to, and control of, crinkle leaf; mulching and fertilizer trials; variety trials. *Entomology* (pp. 31-3): Control of root weevils on tea and of aphids on beans. *Soils and agricultural chemistry* (pp. 34-6): Nutritional studies on sisal, pyrethrum and pineapples in culture solution; drainage requirements of sugar cane; production of geranium oil; composition of dioscorea tubers; *Tephrosia vogelii* as an insecticidal plant. *General investigations* (pp. 43-50): Tea nutrition, tipping and pruning trials; onion manuring, storage and control of blast disease; passion fruit spacing and control of brown spot disease; spacing/fertilizer/variety trial on beans; safflower variety trial; sugar cane variety trials; the development of a machine for decorticating doum palm leaves. *Pyrethrum* (pp. 50-1): Breeding; vegetative propagation; seed sowing rate; fertilizer trials; soil management. *Sisal* (pp. 51-5): Nursery practices; planting material trials; spacing; cover crops; fertilizers; studies on parallel streak disease; breeding; weed control. *Plant pathology* (pp. 54-6): Studies on sugar cane smut (*Ustilago scitaminea*), onion purple blotch (*Alternaria porri*) and parallel streak of sisal. *Horticulture* (pp. 56-7): Pineapple irrigation and the use of growth substances to delay fruit ripening; strawberry breeding and deblossoming; pea nutrition and varieties; geranium propagation by cuttings; dioscorea culture. *Irrigation* (p. 58): Of sugar cane.

7056. KENYA.
Department of Agriculture Annual Report 1963. Vol. I. Report of the Director of Agriculture, 1965, pp. 92, Sh. 5.

General husbandry (pp. 32-7): Variety trials on castor beans and sugar cane; sugar cane fertilizer trial. *Plant pathology* (pp. 43-4]: Work on tomato canker (*Corynebacterium michiganense*), onion purple blotch (*Alternaria porri*) and sugar cane smut (*Ustilago scitaminea*). *Entomology* (pp. 44-6): Chemical control of onion thrips, pyrethrum thrips and pyrethrum red spider mites, and biological control of citrus black fly (*Aleurocanthus woglumi*). *Horticulture* (pp. 49-50): Trials on pineapples, tomatoes, strawberries, geraniums, cabbages and peas. *Pyrethrum* (pp. 51-2): Breeding, culture and pest control. *Sisal* (pp. 52-3): Desuckering, soil management, fertilizers, disease control, weed control, breeding. *Irrigation* (pp. 54-7): Of pineapples and onions.

7057. MAURITIUS.
Annual Report of the Department of Agriculture for the year 1963, 1965, pp. 90, RS.3.

Experiment Stations (pp. 46-59): Banana planting material trial; *Colocasia* manurial trial; bean variety trial; citrus variety trial; cabbage fertilizer trial; onion variety trial; bacterial wilt resistance in tomato varieties; tobacco variety and cultural trials. *Plant Pathology* (pp. 59-63): Studies on tobacco diseases; control of gray leaf spot (*Stemphylium solani*) and bacterial wilt (*Pseudomonas solanacearum*) in tomatoes, pea wilt (*Fusarium* sp.) and chilli powdery mildew (*Leveillula taurica*). *Entomology* (pp. 63-6): Biological control of the rhinoceros beetle (*Oryctes rhinoceros*) of coconuts.

7058. NEW SOUTH WALES.
Annual Report of the Department of Agriculture, New South Wales, for 1963-1964, 1965, pp. 140, 17s. 6d.

Division of Plant Industry (pp. 27-43): Herbicide trials in peas, carrots, parsnips and celery; tobacco nutrition, control of pests and diseases and studies on leaf tainting by fungicides and insecticides; variety trials on safflower, castor beans and oil poppies; cultural trials on safflower; breeding and variety trials on tomatoes, french beans, peas, rockmelons, sweet peppers, cauliflowers, brussels sprouts and broccoli; correction of Mn toxicity in french beans; fertilizer trials on asparagus. *Division of Horticulture* (pp. 44-51): Control of fruit fly, green mould and black spot in citrus; studies on puffing and creasing of citrus fruits; mandarin thinning; lemon rootstock trials; stone fruit breeding and variety trials; chemical thinning of plums and peaches; peach rootstock trials; decline of Doradillo vines; flaccidity of Purple Cornichon table grapes; Zn foliar sprays to improve fruit set in vines; methods of weed control in newly planted vines; vine, apple and pear variety and rootstock trials; treatment of Williams' pears with 2,4-D to obtain parthenocarpic fruit setting; post-harvest handling of bananas; banana nutrition; pineapple selection and variety trials; CA storage of apples; the use of polythene bags and liners for apple and pear storage; control of superficial scald on pears; nutrition in relation to apple storage quality; maturity studies on bananas. *Division of Science Services* (pp. 71-98): Control of blue mould in tobacco; tomato breeding for resistance to fusarium and verticillium wilts; tomato disease control using misting machines; asparagus decline and replant problems; control of *Sclerotinia sclerotiorum* rot in beans; mushroom culture and diseases; control of *Trichodorus* spp. suspected of causing a stubby root condition in citrus; control of black spot (*Guignardia citricarpa*) and brown spot (*Alternaria citri*) in citrus; citrus nutrition; virus, fungal and bacterial diseases of pome and stone fruits; studies on banana heart rot (of undetermined cause); passion fruit breeding for resistance to *Fusarium oxysporum* f. *passiflorae*; relationship between vine bunch stem dieback and nutrition; control of black root rot in strawberries; control of flower blight (*Ovulinia azaleae*) of azaleas; biology and control of fruit tree pests including red spider (*Tetranychus* spp.), European red mite (*Panonychus ulmi*), woolly apple aphid (*Eriosoma lanigerum*), codling moth (*Cydia pomonella*), oriental fruit moth (*Cydia molesta*), light brown apple moth (*Epiphyas postvittana*), apple root weevil (*Perperus* sp.), green peach aphid (*Myzus persicae*), mealybugs (*Pseudococcus* sp.), banana beetle borer (*Cosmopolites sordidus*), macadamia leaf miner (*Acrocercops chionosema*), San José scale (*Quadraspidiotus perniciosus*), frosted scale (*Eulecanium prunosum*), white wax scale (*Ceroplastes destructor*), red scale (*Aonidiella aurantii*), citrus rust thrips (*Chaetanaphothrips orchidii*), citrus gall wasp (*Eurytoma fellis*) and Queensland fruit fly (*Dacus tryoni*); control of tomato and mushroom pests; Mg deficiency studies on citrus; citrus and peach nutrition experiments; Mn toxicity in beans. *Hawkesbury Agricultural College* (pp. 114-19): Washington Navel orange rootstock trial.

7059. Northern Rhodesia.
Annual Report of the Ministry of African Agriculture for the year 1963, 1964, pp. 49, 5s.

Investigational work at 4 research stations is reported in Part III (pp. 18-30) as follows: *Mount Makulu Research Station*: N fertilizer trial on tobacco. *Magoye Regional Station*: Burley tobacco variety trial. *Msekera Regional Station*: Rates and types of N for top dressing and a spacing trial with Burley tobacco. *Misamfu Regional Station*: Coffee variety trials.

7060. Surinam.
L.V.V. in 1963. Overzicht van de verrichtingen van het Departement van Landbouw, Veeteelt en Visserij in 1963. **(A survey of the work of the Department of Agriculture, Stock and Fisheries in 1963.)** *Surinaam. Landb.*, 1964, **12**: 157-295, illus.

The sections on research (pp. 197-203) include brief reports of work on bananas, cacao, coffee, citrus, coconuts, rubber and new or recently introduced crops. Production figures for citrus, cacao, coffee, coconuts, sugar cane and bananas are also given.

7061. Swaziland.
Annual Report of the Department of Agriculture for the year ended 31st December 1963, [undated, received 1965], pp. 37.

Investigations (pp. 21-8): NPK trials on sugar cane and tobacco; citrus soil management, rootstock and fruit blemish studies; cultural trials on pineapples; variety, planting date and spacing trials on tomatoes, cabbages, peas, beans, onions and carrots; nematode control in sugar cane, pineapples and tomatoes; chemical control of citrus black spot and tomato diseases.

New periodicals.

7062. Fiji Department of Agriculture.
The Fiji Farmer. [*Fiji Fmr*], 1965, Vol. 1, No. 1, 9½×6 in., pp. 16, illus., Department of Agriculture, Suva, Fiji, 1s. 6d. per issue.

This new publication, which fills the gap left by the withdrawal of the *Agricultural Journal* in 1962, is intended to supplement the extension services and to provide articles of general interest to farmers in Fiji; more scientific information will be disseminated in the occasional publications of the Department of Agriculture. The intended frequency of publication is not stated.

7063. Institut de Recherches Agronomiques Tropicales et des Cultures Vivrières, Paris.
Cahiers d'Agriculture Pratique des Pays Chauds. [*Cah. Agric. prat. Pays chauds*], 1965, No. 1, 10×8 in., pp. 58, bibls, illus., Inst. Rech. agron. trop. Cult. vivr., 110, rue de l'Université, Paris 7^e, annual subscription 37F.

This quarterly publication, which may be obtained either separately or as a supplement to *l'Agronomie Tropicale*, is intended as an essentially practical and simple guide to workers in the tropics. This issue includes articles (some of which are abstracted separately) under the general headings of soils and fertility, vegetables, sugar cane, tobacco, spice plants, plant protection and the practical applications of research. In addition to the normal pagination, each page is numbered in relation to the general headings, and perforations permit loose-leaf filing according to subject matter.

TEMPERATE TREE FRUITS.

General.

7064. (New Zealand Department of Agriculture, Horticulture Division.)
Report on the official survey of the fruitgrowing industry of New Zealand (1963). Suppl. to *Orchard. N.Z.*, 1965, **38**(3), pp. 32.

Population figures, and notes on their significance, for pome, stone, citrus and certain other sub-tropical fruits, supplementary to the previous survey [see *H.A.*, 30: 3228].

7065. Langer, C. A.
New Hampshire fruit tree survey. *Ext. Bull. N.H. Univ.* **155**, 1964, pp. 15.

Apples, peaches, pears and plums.

7066. Washington Agricultural Experiment Stations.
Washington fruit tree census. *Stats Circ. Wash. St. agric. Exp. Stats* **441**, 1964, pp. 29+ numerous tables.

The results of a comprehensive top fruit survey carried out in 1961 are presented and compared with the records obtained in a similar survey made in 1949. Trees were surveyed by variety and age, and census figures are given for each county.

7067. Porpáczy, A., and Geday, G.
A magyar gyümölcstermesztés 100 éves története. **(A century of Hungarian fruit production.)** [English and Russian summaries 1 p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 63-72.

History and recent progress; in 1959 plums accounted for 35·2% of the total fruit tree population.

7068. Roach, F. A.
Apple production in England. *J. roy. agric. Soc.*, 1964, **125**: 48-72, illus.

In this fascinating survey of the history of apple growing from Roman times to the present day the author gives extracts from the work of early writers on such subjects as varieties, rootstocks, orchard management and marketing, and draws some interesting parallels between contemporary problems and practices and those of former times.

7069. U.S. Department of Agriculture, Agricultural Research Service.
Growing peaches east of the Rocky Mountains. *Fmrs' Bull. U.S. Dep. Agric.* **2205**, 1964, pp. 24, illus.

Culture, diseases, pests and varieties.

7070. Luciani, V.
La coltura delle pesche in Bulgaria. **(Peach growing in Bulgaria.)** *Inf. Ortoflorofruttic.*, 1965, **6**: 197-9, illus.

Production, varieties, harvesting, fruit composition, export figures and processing.

7071. Mihăescu, G., Prodan, G., and Creţan, I.
Potenţialul de producţie şi calitatea recoltei la piersic în condiţiile zonei oraşului Bucureşti. **(The productivity and fruit quality of peach trees grown in the Bucharest zone.)** [English and German summaries ½ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 47-56, bibl. 5.

By good cultural practices 3 crops were obtained from peach trees in the first 5 years after planting, averaging 19 kg. of fruit per tree in the 3rd year, 70 kg. in the 4th and 108 kg. in the 5th year, with Elberta producing a maximum of 151 kg. per tree in the 5th year. The most suitable varieties proved to be Mayflower, Amsden, Rază de soare, Lolo, Elberta and J. H. Hale. Fruit set varied between 56·5 and 89·7%.

7072. Goor, A.
The history of the fig in the Holy Land from ancient times to the present day. *Econ. Bot.*, 1965, **19**: 124-35.

Including sections on varieties, propagation and culture.

7073. Porter, T. N.
Bushels and quality are the key. *Grower*, 1965, **63**: 107.

Economic aspects of apple growing [see also *H.A.*, 35: 4997].

7074. Männel, R.
Die Kostenstruktur im Obstbau. **(Cost analysis in fruit growing.)** *Obstbau, Berlin*, 1965, **5**: 81-3.

Theoretical calculations.

Breeding and varieties.

(*See also* 7137.)

7075. Institut National de la Recherche Agronomique de Tunisie.
Recommandations sur le choix des variétés fruitières en Tunisie. **(Advice on the choice of fruit varieties for Tunisia.)** *Doc. tech. Inst. nat. Rech. agron. Tunisie* **6**, 1964, pp. 33.

Apricots, almonds, citrus, cherries, olives, peaches, pistachios, pears, apples, plums and pecans.

7076. Dermen, H.
Colchiploidy and histological imbalance in triploid apple and pear. *Amer. J. Bot.*, 1965, **52**: 353-9, bibl. 8, illus.

Colchicine treatment of triploid apple varieties (Paragon, Stayman and Baldwin) and a triploid pear selection (U.S. 44–3–1) caused chimera formation. The importance of sexually hexaploid chimeras as breeding material is discussed. [See also *H.A.*, 34: 302.]—U.S.D.A., Beltsville, Md.

7077. Visser, T.
On the inheritance of the juvenile period in apple. [Dutch summary ½ p.] *Euphytica*, 1965, **14**: 125-34, bibl. 9.

Highly significant correlations were found between the length of the juvenile period and the degree to which seedlings or progenies as a whole show juvenile symptoms. Significant correlations existed between the length of the juvenile period of progenies and parent characters such as season of flowering, season of fruit ripening and the length of the growth period of the fruit (the period elapsing between flowering and fruit ripening). A strong correlation existed between the length of the juvenile period of the progenies and the length of the vegetative period of the parents (period elapsing between grafting and first cropping). It appears that flowering in both the juvenile and adult phases is governed by the same factors. [From author's abstract. For earlier work see *H.A.*, 35: 431.]—Inst. hort. Pl. Breed., Wageningen.

7078. Lihonos, F. D.
Some data on the systematics of the genus *Malus* Mill.—Apple. [Russian, with English summary ¼ p.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 5-16, bibl. 23.

See *H.A.*, 35: 5006.

7079. Lihonos, F. D., and Balašova, E. V.
The quantitative anatomical characters of the leaves of some apple varieties. [Russian, with English summary ¼ p.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 17-24, bibl. 5.

Anatomical data have confirmed the value of a geographical classification of apple varieties. Varieties of the central regions of the U.S.S.R. (Russian varieties) have a mesophytic leaf structure, whereas those of the southern regions (south European varieties) have a more xerophytic structure. Varieties originating from the Siberian apple have leaves with small cells and an anatomical structure closely resembling those of the south European group, except that they generally lack pubescence; their growing period starts and ends early and they flower early.

7080. Cireaşă, V.
Contribuţii la metodica de determinare a soiurilor autohtone de măr din depresiunea nemţişorului, raionul, TG. Neamţ. **(Contributions to the systematic identification of indigenous apple varieties in the Nemţişor depression of the TG Neamt district.)** [French and Russian summaries 5 lines each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 247-52, bibl. 21.

The 25 indigenous apple varieties have been distinguished by means of a key which comprises both generative and vegetative characteristics.

7081. Meli, T.
Spurtypen bei Apfelbäumen. **(Spur types in apple trees.)** *Schweiz. Z. Obst- u. Weinb.*, 1965, **101**: 264-7, bibl. 5, illus.

A review, dealing with the characters in which spur types differ from the standard of the variety in question, their advantages and disadvantages, and the types which are now recognized.

7082. Loewel, E. L., Dammann, H.-J., and Saure, M.
Ergebnisse der Apfel-Sortenprüfung in Ottensen. II. 2. Fortsetzung. **(Results of apple variety trials in Ottensen. II. 2nd continuation.)**
Loewel, E. L., and Saure, M.
Ibid. II. Schluss. **(Conclusion.)** *Mitt. Obstb-Versuchsringes, Jork*, 1965, **20**: 108-10, 266-71.

Notes on 20 varieties ripening at the same time as Cox. [For the 1st continuation of Part II see *H.A.*, 35: 5013.]

7083. Schaap, A. A.
Erfahrungen mit neuen Apfelsorten. IV. **(Experience with new apple varieties. IV.)** *Erw-Obstb.*, 1965, **7**: 54-6, illus.

Notes on the performance in Holland of Schweizer Orangenapfel, Spencer and Melrose (ripening at the same time as Golden Delicious); Jonadel, Monroe and Kidd's Orange Red (ripening just before Golden Delicious); and Crandall. [For part III see *H.A.*, 35: 2666.]

7084. Petzold, H.
Die Apfelsorte "Gelber Köstlicher". **(The apple variety Gelber Köstlicher.)** *Obstbau, Berlin*, 1965, **5**: 108-9, bibl. 3, illus.

A pomological description and commercial evaluation of this sport of Delicious.

7085. van Oosten, A.
Welke rode Goudreinette is de beste? **(Which red Belle de Boskoop is the best?)** *Fruitteelt*, 1965, **55**: 788-90, illus.

Three red mutants of the apple variety Belle de Boskoop, namely Verheul, Lambrechts and Schmitz Hübsch (better known as Bieling), are compared on the basis of growers' trials. Verheul gave heavier yields from established trees than did Bieling and seemed less susceptible to frost damage, but the fruit colour was not so good. Trees of Lambrechts grew more vigorously than those of Bieling, but the fruit colour was again poorer.

7086. Howlett, F. S.
Holiday apple. *Ohio Rep. Res. Devel.*, 1965, **50**(1): 10-11, illus.

This new variety, from a cross between Macoun and Jonathan, is described. It shows no tendency to develop Jonathan spot, soft scald or premature internal breakdown, and appears less susceptible to fire blight than Jonathan.

7087. Sansavini, S.
Considerazioni sugli standards varietali del melo e del pero. **(Observations on varietal standards for apples and pears.)** Reprint from *Agricoltore ferrar.*, 1964, No. 9/10, pp. 32, bibl. 1, illus.

Detailed information for Italian growers and fruit traders on the production and market qualities of apple and pear varieties grown in Italy.

7088. Mulkidžanjan, Ja. I.
A new species of pear, *Pyrus theodorovii* Mulk., from the Armenian S.S.R. [Russian, with Armenian summary ¼ p.] *Doklady Akad. Nauk Arm. SSR*, 1965, **40**: 249-51, illus.

The species differs from other pears in the shape and heavy pubescence of the leaves. It is of interest for breeding purposes and is of ornamental value.

7089. Tamássy, I.
Egyes kertészeti növények tulajdonságainak megváltoztatása irányított neveléssel. **(Modification of the properties of some horticultural plants by controlled cultivation.)** [English and Russian summaries 1 p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 5-29, bibl. 12, illus.

Apricots, peaches and almonds [see *H.A.*, 34: 6275].

7090. Enikeev, H. K.
The use of a method of pollinating with a mixture of pollens to obtain interspecific plum and cherry hybrids. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 243-6.

Trials are reported in which American sand cherry (*Prunus besseyi*) was crossed with apricot, and sloe (*Prunus spinosa*) with domestic plum (*P. domestica*). In each case interspecific hybridization was more successful when a mixture of pollens of several varieties of the pollinating species was used than when pollen of a single variety was used.

7091. Tamaši, I., and Pejovič, V.
Atavism or the formation of new forms in apricots (*Armeniaca vulgaris* Lam.). [Russian.] *Agrobiologija*, 1965, No. 2, pp. 231-7, illus.

Morphological characteristics are described of new types of apricot trees obtained in Hungary by grafting buds of an atypical seedling onto wild apricot and almond rootstocks.

7092. Ionova, M. A.
Apricot variety studies in the Crimea. [Russian, with English summary 8 lines.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 110-15.

Data are presented on the yielding capacity, fruit characteristics and resistance to *Clasterosporium carpophilum* and *Sclerotinia* spp. of the 17 varieties which showed the greatest frost resistance over a 17-year period.

7093. von Vahl, E.
Prüfung der Befruchtungsverhältnisse bei Süsskirschenkreuzungen. **(Testing fertility relationships in sweet cherry crosses.)** *ErwObstb.*, 1965, **7**: 126-9, bibl. 6.

7094. Dähne, D.
Kritische Untersuchungen zur Sortenbenennung und Sortenbereinigung bei Süsskirschen unter besonderer Berücksichtigung des westdeutschen Marktsortiments. **(Critical investigations on the varietal nomenclature and identification of sweet cherries with special reference to West German market varieties.)** *Dissert. Fak. Gartenb. u. Landeskult. tech. Hochsch. Hannover*, 1964, pp. 196, bibl. 177, illus.
Zur Frage der Priorität der Sortennamen von Süsskirschen. **(Priority of sweet cherry variety names.)** *ErwObstb.*, 1965, **7**: 93-4.

Almost half of the thesis is devoted to an historical summary of the varietal nomenclature of cherries, the other half being a special study of the origins of important varieties. The development of methods of describing sweet cherries is discussed briefly.

7095. Brooks, R. M., and Griggs, W. H.
New cherry cultivars in California. *Fruit. Var. hort. Dig.*, 1965, **19**: 12-16, illus.

For a more detailed account see *H.A.*, 35: 5028.

7096. Stannard, M. C.
Improving canning peach varieties. *Agric. Gaz. N.S.W.*, 1965, **76**: 17-21, illus.

A breeding programme is described which aims at producing well coloured varieties maturing earlier than Golden Queen. Early, mid-season and late selections and promising introductions are described.—Agric. Res. Stat., Yanco.

7097. Rom, R. C., and Arrington, E. H.
Early peach varieties for use in Arkansas. *Arkans. Fm Res.*, 1964, **13**(6): 4.

Trials are reported in which 3 early varieties, Earlired, Redcap and Sunrise, were compared with Dixired for at least 3–5 years. Dixired attained the highest rating for over-all performance, but Redcap was equal in tree characteristics and slightly better in fruit quality. Earlired matured before Dixired and was similar in appearance and quality. Sunrise was also an excellent variety and is recommended for planting to supplement Dixired and to extend the early harvest.—Peach Substat., Nashville.

7098. Morettini, A.
La Favorita II Morettini (Gialla di Firenze× Fertilia Morettini). **(Favorita II Morettini, a peach hybrid between Gialla di Firenze and Fertilia Morettini.)** *Ital. agric.*, 1965, **102**: 599-604, bibl. 1, illus.

This new selection has firmer and more deeply coloured fruit than that released a year previously [see *H.A.*, 34: 6277], now listed as Favorita I Morettini, and ripens 3–4 days earlier.

7099. Malcolm, H. D. R.
The Golden Queen peach. *Agric. Gaz. N.S.W.*, 1965, **76**: 143-6, illus.

A description of this major canning variety in New South Wales, which originated as a chance seedling in New Zealand.

7100. Komitov, R., and Bambukov, P.
The new peach variety Perla. [Bulgarian, with French and Russian summaries ½ p. each.] *Grad. lozar. Nauka*, 1965, **2**: 147-52, bibl. 4, illus.

This variety was developed from an Elberta × Hale cross and bears large, completely freestone fruits with yellow flesh. It ripens a fortnight earlier than the parent varieties and is suitable both for dessert and for processing.

7101. Randhawa, G. S., and others.
A note on cytology of some plum and peach varieties grown under subtropical conditions. *Indian J. Hort.*, 1964, **21**: 242-3, bibl. 8, illus.

7102. Abramjan, V. N.
The biochemistry of plants in relation to polyploidy. [Russian.] *Vestn. sel’sk. Nauki*, 1965, **10**(3): 130.

Studies on the tissues of a number of plant species, including plums, showed that the protein contents decreased and the oil contents increased with increasing ploidy.

7103. Korovin, S. E., Velikanov, L. P., and Abdullaev, M. A.
A new form of large-fruited cherry-plum from Western Tjan’-Šan. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 55, pp. 123-6, bibl. 6, illus.

Assumed to be a natural cross between *Prunus sogdiana* and *P. ferganica*, which itself is thought to be a hybrid.

7104. Mel’nikova, K. D.
Plum varieties selected from the collection at the Maikop Experiment Station (Institute of Plant Industry). [Russian.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 103-9.

Detailed descriptions of the 16 most valuable varieties selected from 700 studied.

7105. Eaton, G. H.
Queenston, a new early ripening European plum. *Fruit Var. hort. Dig.*, 1965, **19**: 2, illus.

The parentage of this blue, freestone variety is not known. The fruit ripens at the same time as Czar; it is of fair quality but has a tendency to split following heavy rainfall; it is not considered suitable for processing.

7106. Aminov, H. L.
Figs in the Taškent oasis. [Russian.] *Subtrop. Kul’tury*, 1963, No. 3, pp. 79-84, from *Ref. Ž.* (*55. Rasten.*), 1964, Abstr. 10.55.307.

Over a 6-year period 5 local and introduced varieties of fig were studied. The most productive were Kadota, Smirnskij Černyj [Black Smyrna] and Uzbekskij Želtyj [Yellow Uzbek]. The variety Čapla was early, Black Smyrna and Kadota were mid-season and Yellow Uzbek was late. The syconia contained 66·8–79·6% water, 19–25% sugars and 0·16–0·27% acids.

Propagation and rootstocks.

(*See also* 7201, 7255.)

7107. Souček, J., and others.
Podnože Ovocných Stromů. **(Fruit Tree Rootstocks.)** Československá Akademie Věd, Praha, 1965, 9½×7 in., pp. 356, bibls, illus., Kčs. 36.50.

This is a carefully compiled and well produced text book, which must inevitably prove the standard work in the language. Whilst the main authorship is Souček's, some important sections have been undertaken by his colleagues Vlasák (propagation), Dostálek (breeding) and Stohr (some rootstocks and photographs).

The book begins with a dissertation on the significance of rootstocks, the history of fruit-tree rootstocks and its influence on fruit growing, and the developmental work of other countries, particularly the classic studies of Hatton. Raising rootstocks from seed is described, and then, at greater length, come the details of vegetative propagation, choice of soil, maintenance of clonal mother plants and the treatment of layer beds for high productivity. The benefits of etiolation are clearly appreciated. Of interest to those of us who enjoy milder climates are the recommendations on the temporary mounding of the harvested layer beds before deep winter frost. Spacing of stool rows receives special attention, for it has been found that wide planting leads to vigorous, coarse shoot growth and lowers the output of first grade material. Many other methods of propagation are considered: cuttings of various kinds, nurse-roots, suckling or inarching and a special patented method wherein thickly bedded, small-grade rootstocks, which have been mulched with peat, have their rooted side-shoots harvested by stripping or division.

Rootstock/scion effects are discussed in relation to root formation and anchorage, to compatibility in apples, pears, plums, peaches, cherries and walnuts, and to incompatibility in apricots. There are useful tables of comparative vigour at various ages of tree in various countries. A real effort has been made to classify frost resistance according to time and place, but examples of disease and pest resistance receive but slight attention. Stembuilding of apples, pears, plums and cherries, and double-working of pears and apricots, are described. A discussion on the effect of the rootstock on fruit set and productivity is supplemented by numerous extensive tables and by photographs of various systems of culture using dwarfing and vigorous rootstocks in hedgerow form and in wider plantings on the square; the part played by such management on fruit quality is not forgotten. Sixty pages are devoted to the evaluation of the attributes of the various rootstocks, including the Malling series I to XVI and XXV, Crab C, the Swedish A2 and the complete MM. series for apples, and also many rootstocks for other fruits. The important new apple rootstock M.26 is not mentioned, but doubtless this will be remedied at the first reprinting. Then follow recommendations for Czechoslovak conditions and extracts from official ordinances covering seed production, nursery trees and rootstocks.

The need to evaluate available plant material prior to breeding is stressed, rooting propensity and habit, compatibility and frost resistance being important. Current breeding work at Průhonice is described. Finally, in some hundred pages, there are descriptions for identification purposes of all these vegetatively propagated rootstocks, with synonyms and botanical detail, and nearly 200 photographs.

The book is designed to help the serious student in Czechoslovakia. It is a masterly summary and assessment of rootstock research in Europe. Any worthwhile modern work on rootstocks is inevitably embroiled in wider aspects of fruit production. The basic control which the rootstock exerts, the ramifications of its effect upon all factors of growth and cropping, and the consequent need to select, identify and multiply clones of benefit to the industry ensure that this work of Dr Souček's will receive a welcome from his students, his research colleagues and all his countrymen engaged in tree raising and fruit production. R.J.G.

1708. SELL, W. J.
A new budding technique. *Vict. Hort. Dig.*, 1965, **9**(1): 4, illus.

On the stock a vertical ribbon of bark, about 1 in. long, is cut through to the cambium; the top half is removed, the lower half remaining attached at the base. The bud is inserted so that the section below the eye is under the bark, and is then covered completely with plastic binding tape. This method is claimed to be quicker than, and as effective as, the traditional T-cut method for fruit trees.

7109. CHALLENGER, S., LACEY, H. J., AND HOWARD, B. H.
The demonstration of root promoting substances in apple and plum rootstocks. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 124-8, bibl. 7.

An examination of a bioassay for root-promoting substances (rooting co-factors), which are active in association with auxin, was carried out using cuttings of mung bean (*Phaseolus aureus*) in which activity is related to the degree of rooting obtained when the cutting is treated with the test solution and a standard concentration of IAA. Co-factor activity was obtained in hardwood cuttings of Crab C and M.26 apple rootstocks, and was shown in the latter to be increased by high temperature (18·5° C.) during winter storage, a treatment already known to enhance rooting. In extracts of apple rootstocks inhibition of coleoptile straight-growth was obtained at a similar Rf to that showing root-promoting effects, and in a further examination an extract of Myrobalan B plum rootstock, known to inhibit coleoptile straight-growth, was also found to have a considerable effect as a rooting co-factor. [Authors' abstract.]

7110. HOWARD, B. H., AND GARNER, R. J.
High temperature storage of hardwood cuttings as an aid to improved establishment in the nursery. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 83-7, bibl. 1, illus.

M.26 apple hardwood cuttings rooted in less than 2 weeks when given a bottom heat temperature of 75°–80° F. Such short periods of warm treatment can enable cuttings to be planted out in the autumn before soil conditions deteriorate. With M.26 and M.VII apple rootstocks and Old Home pear a comparison between bottom heat at 65° F. for one month followed by November planting, and the usual over-winter storage at 45° F. (minimum) and spring planting, suggested that such earlier planting may be a useful aid to the rapid establishment of rooted cuttings. [Authors' abstract.]

7111. HARTMANN, H. T., HANSEN, C. J., AND LORETI, F.
Propagation of apple rootstocks by hardwood cuttings. *Calif. Agric.*, 1965, **19**(6): 4-5, illus.

Cuttings of 6 Malling and MM. rootstocks, 8-in. long, were taken in January, soaked in 100 p.p.m. IBA for 24 hours and given one of the following treatments: (1) direct planting in the nursery row, (2) storage in damp peat moss at 70° F. for 3 weeks before planting, and (3) storage in a covered outdoor bed, with bottom heat at 70° and the tops exposed to chilling, for 3 weeks before planting. The direct-planted cuttings were planted about 3 weeks before the others; the soil temperature at planting was about 45°. The cuttings receiving treatment (3), particularly M.IX, M.VII, M.26 and MM.111, formed the best root systems. MM.104 rooted poorly with all treatments; both treatments (1) and (3) gave satisfactory results with MM.106, but in general rooting of the other clones was poor with treatment (1).—Univ. Calif., Davis, and Univ. Pisa, Italy.

7112. TYDEMAN, H. M., AND ALSTON, F. H.
The influence of dwarfing rootstocks in shortening the juvenile phase of apple seedlings. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 97-8, bibl. 7.

Nine years after germination 796 (88%) of 902 apple seedlings budded onto 2 dwarfing rootstocks (M.IX and 3431) had flowered, compared with 440 (49%) on their own roots. At 6 years the differences were even more striking: 44% *versus* 5%. There was little difference between the 2 rootstocks in their capacity to induce flowering. [Authors' abstract.]

7113. MIRONOV, K. I.
The effect of the rootstock on the scion. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 290-1.

The growth and development were studied of scions of the apple variety Arkadika grafted in the crowns of 2 apple varieties and 1 pear seedling. Trees grafted on the pear rootstock were more vigorous but less winter-hardy than those on the apple rootstocks, and fruited a year later. The rootstock affected fruit size, shape, colour and flavour, but not leaf shape. In the autumn the leaves of Arkadika on the pear rootstock were more highly coloured than those on the apple rootstocks.

7114. RAMÍREZ, D., AND TABUENCA, M. C.
Influencias recíprocas entre manzanos Malling IX y Malling XVI. **(The reciprocal effects of Malling IX and Malling XVI apples.)** [English summary 7 lines.] *An. Estac. exp. Aula Dei*, 1964, **7**: 165-74, bibl. 7.

Studies made on nursery trees 3 years after grafting showed that M.IX scions significantly increased the bark percentage of M.XVI stocks, whereas M.XVI scions had no effect on the bark percentage of M.IX stocks. M.XVI stocks significantly reduced the bark percentage of M.IX scions, but M.IX stocks had no effect on the bark percentage of M.XVI scions.

7115. MAURER, E.
Leistungsvergleich zwischen East Malling-Typen und Dahlemer Klonen in Schwäbisch Hall. **(A comparison of the performance of Malling rootstocks and Dahlem clones at Swäbisch Hall.)** *ErwObstb.*, 1965, **7**: 81-5, bibl. 2.

The final results are given of a 15-year trial comparing the growth, yield and fruit characters conferred on Boskoop, Goldparmäne, Ontario and Berlepsch apples by a number of Malling and clonal Dahlem rootstocks ranging from very vigorous to dwarfing. [For interim results see *H.A.*, 24: 3479.]

7116. PARRY, M. S.
Field trials of Malling-Merton rootstocks. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 91-6, bibl. 4.

An interim report is given on the field performance of 9 apple rootstocks of the Malling and Malling-Merton series worked with Cox's Orange Pippin, Worcester Pearmain and Laxton's Fortune. The data are summarized from records of 22 demonstration plots planted throughout the fruit-growing areas of England between 1953 and 1956. Total crop, trunk girth and crown spread are compared. In general, the newer rootstocks of the Malling-Merton series have given heavier crops per tree than the older Malling rootstocks of comparable vigour. MM.106 has given the best average performance per tree. Yields varied greatly from site to site, but the relative performance of the rootstocks was comparatively unaffected by site quality or soil type. MM.104 and MM.109 suffered the most damage on poorly drained sites during the very wet winter of 1960/61, confirming similar experience elsewhere with these rootstocks. MM.111 was also considerably affected by waterlogging, contrary to general experience in commercial orchards. [Author's abstract.]

7117. BRAAMS, B. W., AND VAN OOSTEN, A.
MM 106 verdient meer belangstelling. **(MM.106 deserves more attention.)** *Fruitteelt*, 1965, **55**: 454-6, illus.

In trials of Golden Delicious, Cox and Lombartscalville on M.VII, M.IV, MM.111, MM.109, MM.106 and MM.104, Cox cropped more heavily than the other varieties on almost all stocks. The average yield of all 3 varieties was greatest from trees grown on MM.106. There was little difference in tree vigour between the different stocks, but there was a marked difference in the amount of foliage cover and premature leaf-fall; the foliage cover was best in trees on MM.106 and MM.109. The leaves of the trees, particularly of Cox on M.VII, were small and pale in colour during the spring but improved later in the year. In the case of trees on M.IV premature leaf fall was due to Mn deficiency but on the other rootstocks it was due to Mg deficiency; the uptake of Mg was satisfactory in MM.106.—R.T.C., Emmeloord.

7118. BOSSCHAART, P. A.
Enkele gegevens over Doyenné de Comice. **(Some data on Doyenné du Comice.)** *Fruitteelt*, 1965, **55**: 888.

The yields of 14-year-old trees grown on Quince A rootstock alone were greater than those of similar trees on Quince A with an interstock of Beurré Hardy.—FruitDemonstBedrijf, Houten.

7119. ROŞU, F.
Contribuţii la studiul portaltoilor gutuiului. **(Contributions to the study of rootstocks for quinces.)** [French and Russian summaries ¼ p. each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 243-5, bibl. 3.

As a rootstock for the quince variety Champion either seedling or clonal material of the Moşna quince proved more compatible and induced greater vigour than the Malling selections Quince A and Quince C.

7120. DENNEY, A.
Biochemical and field compatibility studies of selected *Prunus* species. *Diss. Abstr.*, 1964, **25**: 3194-5, being *Order No.* 64-13,730 of 122 pp.

In an investigation into the causes of graft incompatibility in closely related species, the leaves of 8 different *Prunus* species were analysed for amino acids, other nitrogenous substances, carbohydrates and several mineral elements. All species contained basically the same amino acids, the only major differences being quantitative: mahaleb cherry contained the highest amounts of total amino acids released through acid hydrolysis and also the highest amounts of free or alcohol-soluble amino acids. Almond contained the highest amounts of total carbohydrates, total starch and total sugar; apricot and almond, with identical values, contained the most reducing sugar. Peach was highest in N and Mn, mahaleb cherry in P, apricot in K and sour cherry in Zn. Copper was highest in sweet and mahaleb cherries. In field trials with several *Prunus* species *P. canescens* appeared to be the most compatible with mazzard rootstocks. Others which grew fairly well on mazzard were *P. virens*, *P. capuli* and *P. fontanesiana*.—Utah St. Univ.

7121. PASSECKER, F.
Die wurzelechte Anzucht von Edel-Aprikosen. **(The propagation of apricot varieties on their own roots.)** *ErwObstb.*, 1965, **7**: 50-2, bibl. 5.

Established apricot varieties cannot be propagated commercially from cuttings or layers, but it was found that new varieties, maintained in the juvenile stage, could be propagated readily from softwood cuttings in the glasshouse. The author has raised a supply of plants on their own roots of the 2 new varieties Türkenschanz-Marille and Imster Marille, the fruit characters of which are described.—Bot. Inst., Univ. Innsbruck.

7122. PRICĂ, D., AND CAŢAVELA, S.
Folosirea prunilor locali ca intermediari pentru cais. **(The use of native plum varieties as intermediate stocks for apricots.)** [English, Russian and French summaries 9 lines each.] *Grăd. Via Liv.*, 1965, **14**(3): 43-6, illus.

Apricot trees on rootstocks of native plum varieties such as Gras, Galben and Buburuz were more vigorous than those grafted on *Prunus cerasifera* [see also *H.A.*, 35: 5052]. The native plums, however, were difficult to propagate. Good results were obtained by using the native plums as intermediates between *P. cerasifera* and apricot.

7123. SCHIMMELPFENG, H.
Vermehrung von Sauerkirschen durch Grünstecklinge. **(The propagation of sour cherries by softwood cuttings.)** *ErwObstb.*, 1965, **7**: 48-50, illus.

The best rooting of Schattenmorelle cuttings under mist was obtained by treating the wounded end with β-IBA at 40 p.p.m. Some rooting occurred when the cuttings were wounded but not treated with growth-substances. When the cuttings were taken at intervals from early June to late July the rooting ability decreased considerably as the season progressed. Tabulated data are presented for the rooting ability of 11 varieties.—Inst. Obstb., München.

7124. Probocskai, E., and Bárdos, K.
A Germersdorfi óriás cseresznye-szemzőhajtás származásának és a szemzés időpontjának hatása a szemek kihajtására (megeredésére) és az oltványok növekedésére. **(The effect of the origin of budwood and the date of budding on the breaking of buds (take) and the growth of grafts in Germersdorfer Giant cherry.)** [English and Russian summaries 1 p. each.] *Kísérl. Közlem., Sect. C*, 1964 (issued 1965), **57C(1)**: 3-17, bibl. 11.

Sweet cherry seedlings planted in early spring were budded on 6 dates during the summer, using as budwood shoots from a 39-year-old tree and from 2-year-old grafts. Budding between 1 August and 15 September, irrespective of the source of budwood, resulted in a significantly higher percentage of take than budding in July. Budwood from the grafts, irrespective of the time of budding, gave a 14–20% higher take than budwood from the bearing tree. Buds from the lower and middle shoots of the grafts resulted in a 14–30% higher take than buds from the leader. No marked differences were observed in the growth of trees budded on different dates with buds of different origin, either during the first or second year after budding.

7125. Toyama, T. K., and others.
Three-year production records from a cherry rootstock study. *Proc. Wash. St. hort. Ass.*, 1964, [1965], pp. 119-20, bibl. 1.
Production records from cherry rootstock study. *Goodfruit Gr, Wash.*, 1965, **15**(2): 7, 10-11.

Data are presented on the yields of Bing, Van and Lambert cherries on various rootstock and interstock combinations [for the first year's results see *H.A.*, 33: 6718]. Van came into bearing early, greatly outyielding Bing and Lambert in the first 3 years. Top-working on Montmorency promoted early bearing, especially of Van. Mahaleb 900 rootstock induced earlier bearing than Turkish mahaleb or New York mazzard, especially of Bing. Top-working on Turkish mahaleb promoted early bearing of Bing but not of Van.—Wash. Irrig. Exp. Stat., Prosser.

7126. Žukov, O. S.
Seedlings and gibberellin. [Russian.] *Sadovodstvo*, 1965, No. 2, p. 31, illus.

Stratified plum seeds were soaked in solutions containing gibberellin at 50, 250 and 1,000 mg./l. or in water (controls) for 6 hours. Seedlings from seeds treated with gibberellin at 250 mg./l. germinated a few days earlier and were stronger than those from other treatments. The leaves of treated plants were considerably larger than those of the controls and remained on the plant longer. The frost resistance of the plants was unaffected by treatment. Seed treatment with gibberellin at 250 mg./l. was also effective in increasing the percentage germination and seedling vigour in almonds.

7127. Liacu, A.
Contribuţii la studiul porumbarului ca portaltoi pentru prun. **(Contributions to the study of the sloe as a plum rootstock.)** [French and Russian summaries ⅓ p. each.] *Lucr. ṣti. Inst. agron. Iaṣi* 1964, pp. 237-42, bibl. 5.

A tall type of *Prunus spinosa*, selected from the local flora, has proved a suitable rootstock for plums.

7128. Rúbia, A. C., Inforzato, R., and Gomes, F. P.
Estacas de amoreira tratadas com hormônios vegetais em dois sistemas de plantio e referentes coberturas do estufim. **(Mulberry cuttings treated with plant hormones and planted by two methods under different frame covers.)** [English summary ¾ p.] *An. Esc. sup. Agric. Queiroz*, 1963, **20**: 115-28, bibl. 3, illus., [received 1965].

Cuttings of Catania 1 mulberry, 25 cm. long and taken 1 cm. below a bud, were treated either with Dieradix D or Dieradix MD powder or with IAA or NAA solution, and then planted in coarse sand in a frame either in the normal position with one-third of their length above the surface or upside down with the base 2 cm. below the surface. Four different covers were compared: opaque glass, plastic film, and coarse white cloth for 30 days with plastic film or without cover for the remainder of the rooting period. The best result after 54 days was obtained with inverted cuttings treated with IAA and with opaque glass as the cover, all 20 cuttings having rooted. With inverted cuttings the mean percentage strike with the different hormone treatments was IAA 91%, NAA 69%, Dieradix MD 64% and Dieradix D 36%. The corresponding figures for normal planting were 44, 2, 2 and 1%.

Defoliation, planting and staking.

(*See also* 7142.)

7129. Kuznecov, M. D.
Chemical defoliation of fruit transplants in the nursery. [Russian.] *Izv. Timirjazev. sel'sk. Akad.*, 1965, No. 1, pp. 110-18.

Several substances were tested for their effectiveness as defoliants of apple trees in the nursery. Magnesium chlorate and calcium chlorate-chloride were the most effective, the optimum concentrations being 0·2 to 0·25% and 0·1 to 0·2% of the active ingredient, respectively. The best time of application was about the second week in September. Most of the leaves fell 14–16 days after treatment. Analysis of the leaves carried out 10 days after treatment showed that the carbohydrate content was reduced, whereas the N content was little affected and the mineral salt content was even somewhat increased. Plants treated with the defoliants did not grow so well as the controls after transplanting, but the after-effects of treatment with the optimum concentrations disappeared within 2 or 3 years. If concentrations greater than the optimum were used, the after-effects were more severe and persisted longer. [For an earlier report see *H.A.*, 34: 2200.]

7130. Katzfuss, M.
Der Wurzelrückschnitt bei der Herbstpflanzung in physiologischer Sicht. **(The physiological aspect of root pruning at autumn planting.)** *Obstbau, Berlin*, 1965, **5**: 90-1, bibl. 4, illus.

The roots and underground portions of the trunk were found to be much richer in starch than the rest of the trunk in all the apple trees tested. Root pruning before autumn planting does not necessarily encourage new root growth and should be avoided because it depletes the tree's nutrient reserves.—Inst. Obst- u. Zierpflanzenb., Dresden-Pillnitz.

7131. Weissenborn, K., and Labus, S.
Holzpfähle im Obstbau. **(Wooden posts for use in fruit growing.)** *Mitt. ObstbVersuchsringes, Jork*, 1965, **20**: 45-9, illus.

Subjects discussed include the suitability of pine and larch wood for oil impregnation, the possibility of using spruce wood with new impregnation methods, the preparation and size of posts required for fencing and for staking various types of tree in various soils, and methods of inserting posts, including a tractor-driven hydraulic press. [See also *H.A.*, 35: 456.]

7132. Novak, R.
Stützvorrichtungen für Obsthecken. **(Supports for fruit hedges.)** *Bess. Obst*, 1965, **10**: 71-4, illus.

Posts and wiring.

Climatic factors.

(*See also* 7195, 7196, 7201, 7207, 7255, 7601.)

7133. Scholz, H.
Anlage und Pflege einer Apfelpflanzung in Angola. **(Establishment and maintenance of an apple orchard in Angola.)** *ErwObstb.*, 1965, **7**: 133-7, bibl. 3, illus.

See *H.A.*, 35: 2720.

7134. Luca, I., Liacu, A., and Rusu, F.
Stabilirea condiţiilor climatice favorabile creşterii caisului în zona oraşului Iaşi în vederea raionării lui. **(The determination of favourable climatic conditions for the growth of apricots at Jassy with a view to extending their culture.)** [French and Russian summaries ¼ p. each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 253-63, bibl. 14, illus.

The temperature, rainfall and R.H. during the period December-April were studied over 10 years in relation to the fruiting of apricots. During this time apricots failed to produce a crop in only one year. It is concluded that the climatic conditions of this area are eminently suitable for apricot cultivation.

7135. Strydom, D. K., and Skinner, J. E.
Studies on the control of delayed foliation of apples, pears and peaches. *Dec. Fruit Gr*, 1965, **15**: 138-41, bibl. 2, illus.

Data are presented from experiments in which sprays of DNOC winter oil emulsion at 5 gal./100 gal. of water were applied on different dates to 6-year-old Golden Delicious and 7-year-old Granny Smith apple trees and to Bon Chrétien pear trees in full bearing. The most effective dates of application were 28 August for Golden Delicious, 11 September for Granny Smith and 4 August for Bon Chrétien. The percentage increases in crop over the untreated trees were 74·1, 53·8 and 83·4. The early application on pears, although resulting in the highest yield, reduced leaf development; application during the period 21 August–11 September is therefore recommended. In experiments with peach trees thiourea at 20 lb./100 gal. of water damaged the trees; the results with DNOC as a 3% summer oil emulsion were inconsistent, but the spray generally increased the number of blossom buds flowering, particularly when applied before bud swell.—Univ. Stellenbosch.

7136. Tabuenca, M. C.
Necesidades de frío invernal de variedades de albaricoquero, melocotonero y peral. **(Winter chilling requirements of apricot, peach and pear varieties.)** [English summary ½ p.] *An. Estac. exp. Aula Dei*, 1964, **7**: 113-32, bibl. 24.

Chilling requirements were studied by a method based on variation in the dry weight of flower buds [see *H.A.*, 27: 3128]. The exact number of hours below 7° C. needed to break dormancy was not determinable for peaches and pears under the experimental conditions, but the 18 peach and 45 pear varieties studied were placed in 4 categories according to their relative chilling requirements. Of the 10 apricot varieties investigated 3 required 750 or fewer hours below 7° C. to break dormancy, 2 required 850, 1 required 950, 3 required 1,050 and 1 required 1,150 hours. Bud drop in apricots due to low temperature is also discussed.

7137. Wilner, J.
The influence of maternal parent on frost-hardiness of apple progenies. *Canad. J. Plant Sci.*, 1965, **45**: 67-71, bibl. 16.

Frost-hardiness of apple-tree tissues, when measured by the conductivity method, appeared to be regulated by hereditary factors. The hardiness of progenies tended to reflect that of their parents, and was more favourably influenced by the hardiness of the maternal than the paternal parent. [Author's abstract. See also *H.A.*, 35: 382.]—Plant Res. Inst., Ottawa.

7138. Eliseev, E̔. I.
The frost resistance of apple and plum varieties in relation to the biochemical characteristics of their buds. [Russian, with English summary 9 lines.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 40-57, bibl. 60.

Data are presented from a biochemical study of the buds of 12 apple and 11 plum varieties, which differed in frost resistance and time of fruit maturity. The more frost resistant varieties accumulated larger amounts of lipoids and carbohydrates and showed a more rapid change in their oxidation and reduction processes. Apple buds initiated in an "off" year contained more sugars, lipoids and carotenes, and fewer nitrogenous substances, than those produced in an "on" year, and were more frost resistant.

7139. Oldén, E. J.
Vårfrostskador på körsbären. **(Spring frost damage to cherries.)** *Fruktodlaren*, 1965, **36**: 82-4, illus.

The relative damage to flower buds of 23 sweet and 17 sour cherry varieties was recorded at Balsgård after a night frost (−3·5° C.) in early May.

7140. Proebsting, E. L.
Experiments show hardiness of buds. *Bett. Fruit*, 1965, **59**(6): 7-8, 14.
Recent advances in cold hardiness research. *Proc. Wash. St. hort. Ass., 1964*, [1965], pp. 37-40.

Popular accounts of work abstracted in *H.A.*, 34: 4212.

7141. Davis, J. R., and English, H.
A canker condition of peach seedlings induced by chilling. *Phytopathology*, 1965, **55**: 805-6, bibl. 3, illus.

Lovell peach seedlings were inoculated with a highly virulent strain of *Pseudomonas syringae*. Those held at 27° C. developed significantly larger cankers at the sites of inoculation than those held at 6°. After 1 month, however, natural stem cankers developed only at the lower temperature; these were in no way associated with the inoculations. Further evidence that the cankers were induced by low temperatures was provided in a second experiment.—Univ. Calif., Davis.

7142. Preston, A. P.
The wind factor in orchard tree spacing. *Sci. Hort., 1964-65*, 1965, **17**: 67-73, bibl. 6, illus.

In a comparison of wind effects in exposed plots of apple trees planted at 3 densities, the run of wind was reduced to the greatest extent by the medium-density plot. In their 13th year the permanent trees on the high-density plot were significantly larger than those on the medium- and low-density plots, and those on the high- and medium-density plots yielded 59% and 67% more fruit per tree, respectively, than those on the low-density plot. [For an earlier report see *H.A.*, 27: 156.] Observations in a uniformly spaced plot, with trees planted on the square, showed that the wind is largely trapped, and its force modified, at about the third row from the windward side; further inside the orchard than this the wind microclimate appeared to be relatively stable.—E. Malling Res. Stat., Kent.

7143. Peyer, E.
Eine Anpassung der Hagelversicherung an den spezialisierten Obst- und Rebbaubetrieb. (**An adaptation of hail insurance for the specialized fruit and vine growing industry.**) *Schweiz. Z. Obst- u. Weinb.*, 1965, **101**: 267-9.

Soils, soil management and irrigation.

(*See also* 6926, 6927, 7478.)

7144. Hirano, S.
On the specific differences in the growth of fruit trees planted in different amounts of soil. [Japanese, with English summary ¼ p.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 287-90, bibl. 4.

The total shoot length and fresh weight per tree were measured after 2 years on young trees of 9 fruit species potted in 45·0, 15·0 and 4·3 kg. of soil per pot. In peaches, figs, vines, walnuts, loquats, apples and pears the growth was poorer the smaller the amount of soil per tree, the effect being most marked in the first 3 species mentioned. In citrus and Japanese persimmon trees, however, maximum growth was obtained with 15 kg. of soil per pot. Root density increased as the volume of soil per pot decreased.

7145. Reinken, G.
Assimilation und Transpiration von Apfel und Roter Johannisbeere in Abhängigkeit von Boden und Humusversorgung. (**The effects of soil and of humus supply on the assimilation and transpiration of apples and red currants.**) [English and French summaries ½ p. each.] *Gartenbauwiss.*, 1965, **30**: 45-56, bibl. 16, illus.

In 5-year pot experiments Golden Delicious apples on M.IV and Houghton Castle red currant bushes were grown in loess loam and in sand with supplements of fertilized peat or compost made from town waste and sewage sludge. Both the apples and red currants made better root growth and had a higher rate of assimilation and a lower transpiration coefficient in sand than in loam soil. The shoot growth of red currants was greater, but that of apples was less, in sand than in loam. The addition of peat or compost promoted the root growth of both crops and increased the production of both fresh matter and dry matter by the apple trees. The compost increased the rate of assimilation of the currants. Both peat and compost reduced transpiration per unit of leaf area and the transpiration coefficient of apples, and compost reduced the transpiration coefficient of red currants. [See also *H.A.*, 35: 408 and 409.]—Inst. Obstb., Univ. Bonn.

7146. Hilkenbäumer, F.
Wirkungsdauer einmalig verabreichter Humusdünger bei Apfel, "Schattenmorelle" und Pfirsich auf verschiedenen Standorten. (**The residual effect of a single application of humus manure on apples, Schattenmorelle cherries and peaches at different sites.**) *Erwerbsobstb.*, 1965, 7: 61-5, bibl. 2

A humus manure consisting of town refuse and sewage sludge, applied at 50–300 tons/ha., was compared with other organic manures at appropriate rates in experimental orchards on loamy and sandy soils. The treatments were applied in 1958 and 1959 and the effects were observed from 1960 to 1963. The increase in organic content of the soil resulting from the treatments persisted throughout the experiment and was particularly evident on heavy soils. The humus manure was alkaline in reaction, and the yield depression observed in some orchards was tentatively ascribed to this. Humus manure and peat both increased apple growth in the early years, except where the pH was already high, and this increase persisted on loam and loess loam soils. With cherries improved growth was observed throughout the experiment under unfavourable soil and climatic conditions, and from the fourth year under favourable conditions. Peaches on sandy soil showed improved growth from the third year onward. Apple yields rose in general in the early years, especially on sandy soil, but there were considerable yield reductions in orchards with a high pH. On poor soil humus manure greatly increased cherry yields in the early years, but on good soil only peat resulted in a slight increase in the early years. Peach yields increased from the third year. [For an account of the investigation up to 1960 see *H.A.*, 33: 2321.]—Inst. Obstb., Univ. Bonn.

7147. Fekete, Z., Horn, E., and Zsoldos, L.
Gyümölcsösök talajvédelmének néhány kérdése. (**Some problems of soil conservation in orchards.**) [English and Russian summaries ½ p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 125-34, bibl. 14.

Several methods of terracing are described and their respective advantages discussed. [See also *H.A.*, 35: 2732.]

7148. Tamási, J.
Különböző agrotechnikai beavatkozások hatása az almafák gyökérzetének alakulására. (**The effect of different cultural practices on the formation of the root system of apple trees.**) [English and Russian summaries 1 p. each.] *Kísérl. Közlem., Sect. C*, 1964 (issued 1965), **57**C(2): 43-63, bibl. 6, illus.

Three-year-old Jonathan trees on wild apple were grown on well manured soil with a straw mulch, green manuring or clean cultivation. The diameter of the root systems was more than double that of the crowns, irrespective of the method of soil management. Sampling showed that under a green manure crop 20·5% of the apple roots were in the top 30 cm. of soil, under clean cultivation 27·2% and under the straw mulch 42·2%. Top growth and root growth were most vigorous in the moist, mulched soil, and the fresh weight of the mulched trees was 2·4 times that of green manured trees and 1·8 times that of clean cultivated trees. Straw for large scale mulching, however, is not available in Hungary, and the use of green manure crops for mulching is recommended.

7149. Boros, R.
Az egyes mikroszervezetek mennyiségi változása a különböző talajkezelések hatására, almagyümölcsös talaján. **(The effect of soil management in apple orchards on the quantitative changes in soil micro-organisms.)** [English and Russian summaries ½ p. each.] *Kert. szöl. Föisk. Közlem.*, 1964, **28**(1, part 2): 73-84, bibl. 12.

In apple orchards the number of soil micro-organisms was greater under a straw mulch than where a green manure crop was used as a mulch in the inter-row, where green manure was ploughed in or where clean cultivation was combined with the application of 100 q./ha. of FYM. [See also *H.A.*, 35: 2738.]

7150. Boros, R., and Bajnok, I.
Különböző talajművelések hatása Jonathán almafa tápanyag alakulására. **(The effect of different methods of soil management on the nutrient status of Jonathan apple trees.)** [English and Russian summaries ¼ p. each.] *Kert. szöl. Főisk Közlem.*, 1964, **28**(1, part 2): 85-98, bibl. 5.

The nutrient status was studied in the leaves, shoots, stem and roots of young Jonathan trees grown under 4 soil management systems [see previous abstract]. The highest content of minerals, in particular N and P, was found in the trees grown with a straw mulch, followed by trees grown with a green manure mulch. The results suggest that N and P are more important for fruit bud formation than is the carbohydrate : N ratio. Clean cultivation, which resulted in the highest carbohydrate : N ratio, produced a relatively small number of fruit buds per metre of shoot.

7151. Srivastava, R. P.
Mulching induces better fruiting in apples. *Indian Hort.*, 1964, **9**(1): 27.

No differences were found during the first 5 years of a trial in which vase-shaped and pyramid-shaped apple trees on Crab C and M.II rootstocks were mulched with pine needles or oak leaves or were left unmulched (control). As time progressed, however, better growth and yields were observed on the mulched trees, particularly on those mulched with oak leaves, and on trees on Crab C rootstocks. An oak-leaf mulch also greatly improved fruit colour. No appreciable effects due to the method of training were observed on fruit yields and quality.—Govt Hill Fruit Res. Stat., Chaubattia (Almora), U.P.

7152. Westwood, M. N., Degman, E. S., and Grim, J. H.
Effects of long-term fertilizer and management practices on growth and yield of pears grown in a clay adobe soil. *Tech. Bull. Ore. agric. Exp. Stat.* **82**, 1964, pp. 39, bibl. 38.

In experiments with Anjou pears tree growth, fruit set and yield were generally greatest with high rates of N, mulches and non-compaction of the soil. Fruit size was not closely related to treatments, but was inversely related to crop density. Fruit set and yield were greater with moderate or heavy pruning than with no pruning, shoot growth being greater with heavy pruning. The stimulus of pruning on fruit set was not transferred to unpruned leaders of the same tree. There was an immediate increase in yield per tree after removal of half the trees (alternate diagonal rows), originally spaced 25 by 25 ft. apart, but yield per acre was reduced. Tree growth and leaf N were greatest with cultivation, intermediate with cover cropping (rye and vetch) and least with sod. Fruit set and yield were greater with cultivation than with other soil management systems, but fruit size was similar in all treatments. Fruit set, yield and size of Bartlett were highest with cultivation and lowest with mulch, but set and yield of Bosc were highest with mulch and lowest with sod. The yield of Bartlett was highest with 1·5 lb. N per tree per year, but 4 lb. N was best for Bosc. The largest fruit of both varieties came from trees in cultivated soil getting 4 lb. N annually. The longest shoot growth occurred on both varieties at the higher levels of N plus cultivation. Leaf N varied directly with the amount of N applied, but at each level of N Bosc leaves contained about 0·3% less N than Bartlett leaves. Both Bartlett and Bosc yielded more fruit with no pruning than with pruning. Maximum yields of fruits larger than 2⅜ inches in diameter were attained by light pruning of Bartlett and by heavy pruning of Bosc (with no hand thinning). [From authors' summary.]

7153. Krylov, Ju. V.
Inter-row cropping in relation to the market quality of apples. [Russian.] *Sadovodstvo*, 1965, No. 5, p. 23.

All types of inter-crop tested in apple orchards reduced fruit quality in the second year compared with that on clean cultivated plots. Minimum reductions in fruit size and yield were obtained with summer-sown peas.

7154. Sosunov, V. I.
Vegetables in the orchard. [Russian.] *Sadovodstvo*, 1965, No. 6, p. 15.

The productivity of both young and old orchards was considerably increased by growing vegetables in the inter-rows. One half of each alley was cropped in alternate years, leaving the other half under clean cultivation.

7155. Ministry of Agriculture, London.
Chemical weed control in top fruit orchards. *S.T.L. Minist. Agric., Lond.*, **15**, 1965, pp. 9.

Newly planted orchards, established orchards (paraquat, diquat, amino triazole, dalapon, diuron, simazine) and spot treatment of stinging nettles, bindweed and docks.

7156. Goddrie, P. D.
Chemische onkruidbestrijding in de fruitteelt. **(Chemical weed control in fruit growing.)** *Meded. Proefstat. Fruit. Volle Grond, Wilhelminadorp*, **5**, 1965, pp. 35, illus.

Instructions for the use of 13 herbicides in tree fruits and small fruits.

7157. Karnatz, H.
Praktische Empfehlungen zur chemischen Unkrautbekämpfung in Obstanlagen. **(Practical recommendations for chemical weed control in fruit orchards.)** *Mitt. ObstbVersuchsringes, Jork*, 1965, **20**: 100-7, bibl. 2.

Chiefly with Domatol, simazine and atrazine. [For earlier work see *H.A.*, 35: 394.]

7158. Hewetson, F. N.
Chemicals control weeds around fruit trees. *Science for the Farmer*, 1965, **12**(3): 11, illus.

The construction is described of an inexpensive, tractor-mounted herbicide sprayer. Trials at the Fruit Research

Laboratory, Arendtsville, and elsewhere have led to the following recommendations: for apples in bearing, a mixture of amitrole, simazine and dalapon; for peaches in bearing, a mixture of simazine and dalapon; for bearing pears, a mixture of amitrole and simazine; for sour cherries, simazine alone; and for non-bearing stone and pome fruit trees, simazine alone.

7159. Tweedy, J. A., and Ries, S. K.
Nature of deciduous fruit tree tolerance to herbicides. *Abstr. 1964 Mtg Weed Soc. Amer.*, p. 92.

Apple seedlings and pears showed the greatest tolerance and apple rootstocks (M.VII) and cherries (mahaleb and mazzard) showed the least tolerance to simazine, atrazine, prometryne, diuron, amitrole and dalapon applied (1) on the soil surface, or (2) in contact with the root systems of 1-year-old trees. Peaches, plums and apricots were intermediate in tolerance. While herbicides placed in direct contact with roots were the most injurious, the results showed a real physiological resistance in certain species. When peaches, variety Red Haven, and apricots, variety Manchu, were each budded on 1-year-old seedling rootstocks of apricot and peach, tolerance to simazine and prometryne was determined by the nature of the scion and not by that of the rootstock.—Mich. St. Univ., E. Lansing.—*Weed Abstr.*, **14**, No. 98.

7160. Kuznecov, M. D.
Herbicides in the nursery. [Russian.] *Sadovodstvo*, 1965, No. 4, pp. 24-5, illus.

In apple and pear nurseries simazine at 5·5–6 kg. a.i./ha. gave good weed control both in the year of application and in the following year without injuring the nursery stock. Chlorazine at 1, 3 and 5 l./ha. also gave good weed control without crop damage, but sodium trichloroacetate stimulated rather than controlled weed growth, and dalapon damaged the trees.

7161. Taylor, R. L.
Establishment of apple and pear trees in grass. *Proc. 16th N.Z. Weed Control Conf., 1963*, pp. 28-32, bibl. 1.

The seasonal growth of young apples and pears was improved when grass at the base of the trees was killed by herbicides or by cultivation. Hoeing of both sprayed and unsprayed plots resulted in the re-establishment of vegetation in the autumn, and this was beneficial to next season's growth. Spraying alone produced better growth the same season than cultivation, but the vegetation did not re-establish during the winter and the next season's growth was reduced. Best results, in terms of tree growth, were obtained on plots sprayed in the spring and hoed in the early summer. Dalapon Na was relatively ineffective against *Lolium* spp. and *Holcus lanatus*. Paraquat at 0·04% active cation was very effective against *Lolium* spp., but 2 applications were needed to control *Dactylis glomerata* and *Bromus catharticus*. Apples were more tolerant of foliar sprays of paraquat than were pears.—From *Weed Abstr.*, **14**: No. 99.

7162. Jurina, L. V.
Mulching with peat treated with herbicides. [Russian.] *Sadovodstvo*, 1965, No. 5, pp. 18-19.

In 2 years' trials mulching around young apple trees with granulated peat treated with simazine at 4 g./sq. m. and spraying the surrounding areas with simazine at 0·4 g./sq. m. controlled weeds more effectively and resulted in greater shoot growth than atrazine used in a similar manner, hand hoeing, treatment with herbicide only or mulching with untreated peat plus hand hoeing.

7163. Perehodkin, L. P., and Slutč, A. S.
Simazine in the orchard. [Russian.] *Sadovodstvo*, 1965, No. 6, p. 21.

Trials are reported in which simazine at 5 kg./ha. was applied to the soil, 1·5 m. from the trunks of apple trees, with and without a peat mulch. Mulching before or after spraying, or mulching with simazine-treated peat, reduced the herbicidal action of the simazine and increased the cost of treatment. No phytotoxic effects were observed on the trees when simazine was used without the mulch.

7164. Rom, R. C., Arrington, E. H., and Westbrook, C. J.
Herbicides in Arkansas peach orchards. *Arkans. Fm Res.*, 1965, **14**(2): 11, illus.

The results are given of herbicide trials in 1963 and 1964 in an orchard of Amber Gem peach trees. In 1963 simazine applied in April at 2 lb. a.i. per acre in a 2-ft. band on either side of the trees gave almost complete suppression of weeds until the end of September, and improved growth. In the 1964 tests diuron at 2 and 4 lb. a.i. per acre and diphenamid at 4 and 8 lb. a.i. per acre suppressed weeds to an even greater extent and the plots were almost weed-free in mid-October.

7165. Forshey, C. G.
Factors affecting the response of apples to irrigation. *Proc. N.Y. St. hort. Soc., 1965*, [1965], **110**: 109-14.

Data from 7 years' studies on the fruit growth of 3 apple varieties on 4 soil types showed that, even in the most unfavourable locations, at least 30 days with the available soil moisture below 25% were needed to cause a measurable reduction in fruit size. Under favourable growing conditions fruit size was unaffected by a low soil moisture level for periods of up to 50 days. Irrigation trials on 3 varieties are reported, and the influence of crop load and N levels on the response to irrigation are discussed.—Hudson Valley Lab., Highland, N.Y.

Nutrition and tree composition.

(*See also* 6975, 7102, 7120, 7130, 7138, 7150, 7152, 7200, 7201, 7478, 7532.)

7166. van't Westeinde, R. L.
Centrifugaalstrooiers in de fruitteelt. (**Centrifugal distributors in fruit growing.**) *Fruitteelt*, 1965, **55**: 327-8, illus.

The 2 centrifugal fertilizer distributors tested proved reasonably satisfactory for the 3 methods of application studied, viz. broadcasting, placement close to the trees and placement along the grass strips adjacent to the trees.—LandbPraktSch. Prins Willem, Schoondijke.

7167. Smith, C. B.
A five-year nutritional survey of Pennsylvania apple, peach, and sour cherry orchards. *Bull. Pa agric. Exp. Stat.* **717**, 1965, pp. 16, bibl. 10.

Median leaf samples were selected at 4 periods during each of 5 seasons from 15 Stayman apple orchards, 18 Elberta peach orchards and 9 Montmorency sour cherry orchards located over a wide range of soil types. The leaf samples were analysed for 8 or 9 important nutrient elements by a combination of chemical and spectrographic procedures. Soil samples were selected from the apple and peach orchards in each of 4 years and their analyses compared with appropriate leaf concentrations. Variations in leaf composition between periods of sampling, between years and between orchards are discussed and compared. In general, variability between sampling periods was greater than, or as great as, variability between either years or orchards, but this varied considerably with the different nutrient elements. N and Ca concentrations, while showing strong seasonal trends, were least variable between years or orchards, whereas Mg and Mn concentrations were most variable between orchards. The comparison of leaf and soil data indicated that standard soil test results did not give a good indication of the amounts of N, P or K absorbed by the trees. The concentrations of certain nutrient elements, especially Mn, were markedly affected by the soil pH. [Author's digest.] Other elements studied were Fe, Cu and B.

7168. Lixandru, G.
Creşterea puieţilor şi acumularea elementelor nutritive în măsa vegetală la cîteva specii forestiere şi pomicole în pepiniere. **(Growth and nutrient element accumulation in the tissues of certain forest and fruit tree species in the nursery.)** [French and Russian summaries 7 lines each]. *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 297-305, bibl. 11.

In this study on the accumulation of N, P, K, Ca and Na in 13 tree species, including cherry, crab apple and walnut, in their first year in the nursery, in relation to their growth, 3 phases could be distinguished, which led to certain preliminary recommendations on fertilizer application.

7169. Fregoni, M., and Gambi, G.
Assorbimento fogliare nelle piante da frutto. **(Foliar absorption by fruit trees.)** *Progr. agric., Bologna*, 1965, **11**: 725-40, illus.

Microscopic examination over a 3-year period of the leaves of apples, pears, peaches, plums, cherries, apricots and vines led to the following conclusions. On the current year's growth the basal and median leaves did not differ significantly in thickness or structure. Each species presented considerable varietal differences in leaf structure and thickness. Good foliar absorption, as in apples, vines and peaches, was associated with thin cuticle and epidermal tissue, cell regularity in epidermal and palisade tissues, large intercellular spaces in the mesophyll and abundant hairs on the lower epidermis. In general, the apical leaves were thinner and had a larger proportion of vascular tissue than those below them. The thinnest leaves with the highest absorptive capacity were those emerging at bud burst. The differences in leaf structure could not be considered as solely responsible for differences in absorptive capacity between the species.—Univ. Piacenza.

7170. Ljones, B.
Bladanalyser i forskning og konsulentvirksomhet. **(Leaf analysis in research and advisory work.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 288-94.

Data collected from private gardens are presented on the optimum range of major nutrients in apple leaves. From analyses of the leaves and fruits of Gravenstein in Norway in 1962 the highest and lowest figures for major nutrients, ash and B are presented, and also the size of groups of samples showing above-average, below-average and average contents of N, K, Mg and B. Leaf analyses from a long-term experiment on K manuring showed a decrease in leaf contents of Ca and Mg with the first increment of potassium sulphate. Data from a fourth experiment showed that the effect of N manuring on leaf composition was influenced by variety.

7171. Nyhlén, Å.
Gödslingsförsök med äpple vid Nyckelby åren 1940-1963. **(Manurial trials with apples at Nyckelby from 1940 to 1963.)** [English summary 1 p.] *LantbrHögsk. Medd., Uppsala, Ser. A*, **27**, 1965, pp. 24, bibl. 8, illus.

The soil at Nyckelby Horticultural Experiment Station is medium clay with some silt; it is rich in K but poor in P. In a trial with 2 varieties on 3 rootstocks no improvement in yield was apparent following the application of 20,000 kg./ha. of FYM, or of its N equivalent plus P and K as artificial fertilizers. There was, however, an effect of soil type on yield. Fruits from unfertilized plots kept better in storage than fruits from fertilized plots. In a second trial with 2 different varieties on 3 rootstocks there were no significant differences in yield between unfertilized and fertilized plots. Yields from trees on the most vigorous rootstock (M.I) were a little higher on unfertilized than on fertilized plots. On M.IV (=A 22) yields were slightly higher after fertilization, especially with high N. Soil analyses showed that the effects of P and K fertilizers were apparent in the top (0–20 cm.) layer of soil, but at deeper levels the effect was slight.

7172. Bünemann, G.
Die Fruchtqualität beim Apfel in Abhängigkeit von der Nährstoffzufuhr. II. Versuche zur Kationen- und Stickstoffversorgung und ihrer Qualitätsbeeinflussung. **(The quality of apple fruits in relation to nutrient supply. II. Experiments on the supply of cations and nitrogen and their effect on quality.)** [English and French summaries 1 p. each.] *Gartenbauwiss.*, 1965, **30**: 3-44, bibl. 57, illus.

Pot experiments with Cox on M.IV supplied with various amounts of K, Ca and Mg, and field trials with Jonathan and Laxton's Superb on M.IV and M.VII supplied with various amounts of K and N, showed that generally the content of a given element in the leaves, fruit and 1-year-old shoots was related to the level of supply, but there was some variation in the different years. An increased K supply tended to increase the K content of the leaves and fruit, reduced the Ca and Mg contents of the leaves and increased the acidity and Mg content of the fruit. The M.VII rootstock induced a higher N content in the fruits than M.IV rootstock. The N content of fruit and leaves was affected by N supply, which also increased fruit acidity in one year. Bitter pit tended to be associated with high K and Mg and a low Ca supply, but in general no definite effects on physiological disorders or fruit quality could be ascertained within the limits of the amounts of nutrients supplied. [For part I see *H.A.*, 35: 5178.] —Inst. Obstb., tech. Hochsch., Hannover.

7173. Gorin, T. I.
A progressive system of fertilization. [Russian.] *Sadovodstvo*, 1965, No. 6, pp. 19-20.

In 4 years' trials maximum yield increases in irrigated apple orchards were obtained with applications of organic plus PK fertilizers once every 2 or 3 years, combined with 3 annual applications of N in May and June followed by applications of P fertilizer at the time of the June drop and in the first half of July.

7174. ARCHIBALD, J. A.
N-K teamwork for peaches. *Bett. Crops*, 1965, **49**(2): 30-2, illus.

Notes on some trials at Vineland indicating that a balanced high level of N and K in the leaves is required for high peach yields.

7175. HIRAI, J., AND OTHERS.
Studies on the nutrition of fig trees. I. The effects of nitrogen, phosphoric acid and potassium concentrations on the growth, yield and quality of the fruits. [Japanese, with English summary ¼ p.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 273-9, bibl. 9.

In sand-culture trials on Masui Dauphine fig trees the maximum growth of non-bearing trees was obtained with an N level of 80 p.p.m. and P_2O_5 and K_2O levels of 40 p.p.m. each. With bearing trees the maximum growth, yields and fruit quality were obtained with N, P_2O_5 and K_2O levels of 80, 80 and 160 p.p.m., respectively. N levels influenced the vegetative and reproductive development of the trees, P_2O_5 levels affected fruit quality, colour and rate of maturation, and K_2O levels affected fruit quality and yields.

7176. HVATUM, O. Ø.
Bestemmelse av varmtvannløselig bor i jordprøver fra norske borgjødslingsforsøk. **(The determination of hot-water-soluble boron in soil samples from Norwegian boron fertilizer trials.)** [English summary ¾ p.] *Meld. Norg. LandbrHögsk.*, 1965, **44**(1): 1-12, bibl. 15.

When the amount of hot-water-soluble B in soil samples was determined colorimetrically, using 1,1-dianthrimide, the values obtained showed a good correlation with the rate of B fertilization. In apple trees growing on a loamy, gravelly soil rich in humus B deficiency occurred at a soil level of 0·39 p.p.m. B. On a sandy, humus-rich soil raspberries showed a probable B deficiency at a soil level of 0·29 p.p.m. B. Black currants showed B toxicity at about 0·56 p.p.m. B in an unlimed, sandy, moraine soil rich in humus.

7177. DÉMÉTRIADÈS, S. D., GAVALAS, N. A., AND PAPADOPOULOS, S. E.
Trials for the control of lime-induced chlorosis in fruit trees in Greece. I. Preliminary observations on peach and lemon trees. *Ann. Inst. phytopath. Benaki*, 1964, **7**: 28-36, bibl. 15, illus.

In a trial on peaches suffering from advanced chlorosis NaFeEDDHA, NaFeDTPA and NaFeHEEDTA were applied as soil treatments and as 0·1% foliar sprays. The foliar treatments resulted in green spots on the leaves and some phytotoxicity. Soil treatment with 100 g. or 200 g. NaFeEDDHA or with 300 g. NaFeDTPA induced complete recovery; NaFeHEEDTA at 300 g. was slightly less satisfactory. Soil treatment with ferrous sulphate, with or without additional sulphur, was ineffective. In a similar trial on lemon trees the efficiency of NaFeEDDHA as a soil treatment was confirmed. Mn deficiency symptoms were observed on the NaFeEDDHA-treated trees; it is not known whether the deficiency was induced or unmasked by the treatment. In the foliar treatments the addition of urea to the ferrous sulphate sprays had a favourable effect on Fe absorption.

7178. BESTER, A. J., MEYNHARDT, J. T., AND STRYDOM, D. K.
Uptake of foliar-applied urea by deciduous fruits. *Dec. Fruit Gr*, 1965, **15**: 102.

Urea applied as a foliar spray was absorbed by the leaves of apples, pears, peaches and vines, being found in the roots of all of them within 9 days. Pear leaves absorbed the most and vine leaves the least. No damage was caused by a 0·5% urea solution, but at 1% leaf injury sometimes occurred. The addition of the wetting agent Teepol reduced the uptake of urea by the leaves. Recommendations are given for urea applications to these crops.—Fruit and Food Technol. Res. Inst., Stellenbosch.

7179. HENZE, J., AND LANGE, H. J.
Generative und vegetative Leistungen in Apfelanlagen. I. Mitteilung: Einfluss gesteigerter N-Gaben. **(Cropping and growth in apple orchards. I: The effect of increased N applications.)** [English, French and Spanish summaries ⅓ p. each.] *Mitt. Klosterneuburg, Ser. B*, 1965, **15B**: 133-44, bibl. 18.

With young trees, where yields were still on the increase, raising the N application rate from 0 to 60 kg./ha. resulted in increases in yields. Higher rates of N often had a deleterious effect on yield, especially on marshy soils. There was an increase in the growth of young wood as the rate of application of N was raised from 100 to 200 kg./ha., and this may have caused the reduction in yield. The yield of older trees increased progressively as the N application rate was raised from 0 to 180 kg./ha.—Inst. Obstb., Univ. Bonn.

7180. HILKENBÄUMER, F., AND SCHRODT, W.
Die Auswirkung einer Zusatzdüngung von Stickstoff auf die vegetative und generative Leistung von Apfelspindeln. **(The effect of a supplementary application of nitrogen on the growth and yield of apple spindle bushes.)** *Erw-Obstb.*, 1965, **7**: 85-90, bibl. 23.

A summer application of 60 kg. N per ha. in addition to the spring dressing of 150–180 kg. increased growth, the best dates being mid and late June for Goldparmäne and Cox and mid July for James Grieve. Later applications up to mid October, or doubling the summer dressing, only increased the growth of the young shoots. Yield in the following year was also improved, especially by application at the end of June or in mid July, as a result of the greater fruit number arising from increased flower production. With Golden Delicious very late applications gave yield increases due to greater fruit size. Doubling the summer N dressing produced little extra yield. The leaf N content was increased by the summer dressing but the fruit N content varied irregularly. Fruit storage quality was unaffected by the summer dressing. There were no differences in growth, yield or storage characters due to the source of N.—Inst. Obstb., Univ. Bonn.

7181. HOSOI, T., ISHIDA, M., AND TERANUMA, T.
Histological studies on the fruit development of pears with reference to nitrogen, phosphorus and potassium nutrition. III. The relationship between cell division during the development of the flesh and the composition of the carbohydrates and nitrogen in the shoot. [Japanese, with English summary ¼ p.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 311-15, bibl. 5.

In sand-culture studies on Nijisseiki pears highly significant correlations were found between the cell number in the young fruits on 20 April (10 days after full bloom) and the starch and total carbohydrate contents of the shoots on 8 February. Negative correlations, which were not significant, were found between the cell number and the N fractions in the shoots. On 8 May the cell number was negatively correlated with the carbohydrate content and positively correlated with the N content of the current season's shoots. [For part II see *H.A.*, 35: 5171.]

7182. ŞTEFAN, V., AND OTHERS.
Folosirea izotopului radioactiv P^{32} în studiul asimilării fosforului de către măr şi păr. **(A study of phosphorus assimilation by apple and pear trees using the radioactive isotope P^{32}.)** [English and German summaries ½ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 75-85, bibl. 12, illus.

The experiments were carried out under field conditions on Goldparmäne apples and Curé pears. The uptake of P by both species was greater when fertilizer P was applied during the growing season than when no P was applied. With pear trees the increase in P absorption was 12–47% when superphosphate was applied alone, and 17–25% when superphosphate was applied with K salts. The concentration of P^{32} in the apple fruits was more than twice that in the leaves, and the fruiting branches of pears absorbed more than the vegetative branches. [For related work see *H.A.*, 34: 6330.]

7183. RITTER, R.
Der Caesium 137-Gehalt von Äpfeln in Abhängigkeit von der Kaliumdüngung. **(The Cs^{137} content of apples in relation to potassium fertilization.)** *Naturwissenschaften*, 1965, **52**: 304, bibl. 2.

Increasing the K content (ash) of Jonathan apple fruits by factors of 1·2 and 1·4 through K fertilization caused reductions in the activity of Cs^{137} of 15 and 40%.—BundesforschAnst. LebensmittFrischhalt., Karlsruhe.

7184. STILES, W. C., AND GOFF, K. R.
Zinc deficiency in Maine orchards. *Me Fm Res.*, 1965, **12**(4): 1-2.

In a trial on Golden Delicious apples growing on Zn-deficient soil an increase in yield from 12·1 to 18·9 bushels per tree was obtained by the soil application of 10 lb. of zinc sulphate per tree. On Northern Spy apples a single spray application of zinc sulphate about 2 weeks after the calyx stage resulted in a similar yield increase.

Training and pruning.

(*See also* 7152.)

7185. REICHEL, M.
Pflanzenbauliche und anbautechnische Gesichtspunkte beim Obstbaumschnitt. **(The pruning of fruit trees from the standpoints of production and training techniques.)** *Obstbau, Berlin*, 1965, **5**: 87-90, bibl. 15, illus.

A review, dealing mainly with apples, pears and cherries.

7186. NEUMANN, D., AND NEUMANN, U.
Die Beziehungen zwischen Standfläche und Standflächennutzung unter Berücksichtigung von Standzeit und Kronenerziehung. **(The relationship between the available area [per tree] and area use in relation to age and crown training.)** *Obstbau, Berlin*, 1965, **5**: 105-6, bibl. 2.

Examples are given for apples. [See also *H.A.*, 35: 452.]

7187. GYURÓ, F.
Intenzív művelésmódok a nagyüzemi gyümölcstermesztésben. **(Intensive methods of cultivation in large-scale fruit production.)** [English and Russian summaries ¾ p. each.] *Kert. szöl. Föisk. Közlem.*, 1964, **28**(1, part 2): 113-24, bibl. 33.

Half-standard Jonathan trees on crab rootstocks produced over 8 years an annual average yield of 140 kg./tree or, at a spacing of 10×10 m., 14 tons/ha. Spindle bushes of 5 varieties during the first 4 years came into bearing as follows: Cox's Orange Pippin 100%, Staymared 77%, Winter Golden Pearman 57%, Jonathan 32% and Starking 1%. The yields of 3-year-old trees on M.IX trained in supported hedge form, spaced 3 m. apart in rows 2 m. apart, were Staymared 202 q./ha., Golden Delicious 191 q./ha., Jonathan 100 q./ha. and Starking 60 q./ha. In vertically planted hedges shoot growth showed apical dominance, whereas the Bouché-Thomas system of planting at an angle of 30° to the ground encouraged basal growth.

7188. VAN LOOKEREN CAMPAGNE, P.
Geeft een haagbeplanting minder arbeid dan een spillenaanplant? **(Does hedgerow planting give less work than a spindle plantation?)** *Fruitteelt*, 1965, **55**: 698-700, illus.

The work involved in harvesting, pruning and thinning apple trees is compared, in terms of man-hours per crate of fruit, for plantations of bush, tall and low spindle and hedge trees. Ladders were needed for harvesting bush and tall spindle trees, and this accounted for 15% of the total man-hours involved; fruit from young 2-tier spindles and from hedge trees was harvested from ground level. The pruning of hedges took only 30 man-hours per ha., as compared with 145 for established bush trees and between 70 and 56 for various types of spindle tree. The time involved in thinning fruit was compared for 11-year-old trees on the rootstocks M.IX and M.II (1,000 and 400 trees per ha., respectively); it took 9 man-minutes to thin a small tree (on M.IX) compared with 27 man-minutes for a large tree (on M.II), and yields per ha. were 34,000 kg. and 29,200 kg., respectively.—Inst. TuinbTech., Wageningen.

7189. CONSTANTINESCU, N., LUPESCU, F., AND MILIŢIU, I.
Comportarea unor soiuri de măr şi păr pe portaltoi vegetativi în diferite sisteme de formare. **(The performance of some apple and pear varieties on vegetatively propagated rootstocks as affected by different training systems.)** [French and Russian summaries 1¼ pp. each.] *Lucr. şti. Inst. agron. N Bălcescu, Ser. B*, 1964, **7**: 15-28, bibl. 9.

The growth, development, time of coming into bearing and yields were studied in 13 apple and 9 pear varieties, using 13 different training systems. Among the conclusions reached were the following: Those training systems which approached most closely the natural habit of the tree were the most suitable. Of the types of horizontal cordon studied, the double and the stepped cordons were the easiest to manage and the most productive. For the vertical systems studied, the order of merit was (1) single vertical cordon, (2) single-U, (3) 4-branched candelabra palmette and (4) double-U. Trunk girth was more dependent on the variety than on the training system. The growth of fruiting shoots was more uniform on vertically than on horizontally trained branches, but the length of the fruiting shoots was correlated with variety rather than training system. [See also *H.A.*, 34: 6360.]

7190. Pricǎ, D., and Pasc, I.
Transformarea coroanei piramidă etajată în palmetă la mărul pitic. **(Conversion of apple trees from pyramid to palmette forms.)** [Russian, French and English summaries ¼ p. each.] *Grăd. Via Liv.*, 1965, **14**(4): 50-6, bibl. 5, illus.

Converting 3–4-year-old Jonathan and Northern Spy trees on M.IX from a pyramid to a palmette form increased yields by 69–87% from the first year, reduced production costs by 26–33% and raised income per ha. by 92–103%.—Stat. exp. horti-vitic., Geoagiu.

7191. Fomenko, Ju. E.
Post-planting pruning of apple trees. [Russian.] *Sadovodstvo*, 1965, No. 4, pp. 18-19.

In trials on trees of 2 varieties pruning in the year of planting reduced both tree growth and winter-hardiness. The type of pruning required during the second year after planting varied with the variety and with its ability to break dormancy.

7192. Maškova, E. P.
Pruning accelerates fruiting. [Russian.] *Sadovodstvo*, 1965, No. 2, pp. 21-2, illus.

Pruning trials are reported in which increased yields were obtained in the 7th year from Boiken and Jonathan apple trees on which the current year's shoots had been pruned to the 4th–6th bud during the first 5 years and to the 10th–12th bud in the following year. The control trees were unpruned.

7193. Preston, A. P.
Tydeman's Early and Worcester Pearmain apples under two pruning treatments. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 88-90, bibl. 5, illus.

Trees of Tydeman's Early and Worcester Pearmain on M.VII and M.II that had been renewal pruned for 10 years were either renewal or established-spur pruned for a further 7-year period. Allowing 2 years for the conversion of formerly renewal pruned trees to the established-spur method, data are presented for a 5-year period on growth and cropping, time of picking and average fruit size. Established-spur pruning did not reduce the yield compared with renewal pruning with either variety, and in most years it increased fruit size. The percentage of fruit of Tydeman's Early in the first picking was usually greater for renewal pruned trees. Established-spur pruning of young trees of Tydeman's Early might delay bearing, but it appears feasible for bearing trees of this variety to be made more manageable by working back laterals to form spur systems. [Author's abstract.]

7194. Kumashiro, K.
Studies on "Ijoyo" (abnormal leaves) of Nijisseiki pears developed as a result of a certain training system. I. [Japanese, with English summary ⅓ p.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 302-10, bibl. 10, illus.

Leaf abnormalities are described which are found only on the pear variety Nijisseiki, and only when the shoots are allowed to grow vigorously without being cut back for 1 or 2 years, as occurs with the Momozawa training system. The disorder was corrected by cutting back the tips of vigorous shoots during the dormant period. Cutting back the tips after abnormal leaves had developed was ineffective.

7195. Kajmakan, I. V.
Summer pruning of apricots. [Russian.] *Sadov. Vinograd. i Vinodel. Moldavii*, 1963, No. 4, pp. 23-7, from *Ref. Ž.* (*55. Rasten.*), 1964, Abstr. 10.55.313.

Summer pruning of apricots (cutting back by a half all summer shoots except the leaders) greatly reduced spring frost hazards. Pruning on 25 May retarded the beginning of bud initiation by 20 days, on 5 June by 28 days and on 15 June by 40 days. The greatest total secondary growth was recorded on trees pruned on 25 May and the smallest on trees pruned on 15 June. Shot-hole disease on the summer-pruned trees, regardless of the date of pruning, did not exceed 22–24%, compared with 81–94% and even 100% on the controls. Flower buds on the secondary growth, except those on trees pruned on 15 June, were the most resistant to premature bud burst. The lowest percentage of bud loss was recorded on trees pruned on 25 May.

7196. Čebotaeva, T. F.
The influence of pruning on frost injury to sour cherries. [Russian.] *Sadovodstvo*, 1965, No. 2, pp. 23-4, illus.

Trees of 2 varieties were pruned in the spring, with and without additional N fertilizer, or in the summer (10–15 June). Both spring and summer pruning increased shoot growth, but spring pruning+N fertilizer gave the best results, increasing the length of both the vegetative period and the period of flower bud differentiation. In all treatments fruit buds on long shoots over-wintered better than those on short shoots. These differences, however, were very small on unpruned trees. Buds tended to form on long shoots under cool, wet conditions in the summer-autumn period and on short shoots during warm, dry summers. The variety Ljubskaja showed greater differences between treatments and less frost resistance than the variety Vladimirskaja.

7197. Džiljanov, L.
The effect of the form of the crown on the skeletal root system of peaches. [Bulgarian, with English and Russian summaries 6 lines each.] *Grad. lozar. Nauka*, 1965, **2**: 131-5, bibl. 6, illus.

Studies on peach trees with cup-shaped crowns or trained as palmettes showed that the shape of the crown influenced both the size and shape of the skeletal roots and the development of root hairs. The main skeletal roots grew in the same directions as the major skeletal branches.

7198. Savage, E. F., Hayden, R. A., and Ward, W. E.
Severity of pruning of Elberta peach trees as it affects growth and yield. *Bull. Ga agric. Exp. Stats* **N.S. 127**, 1964, pp. 11, illus.

Trees which were given moderate corrective pruning up to the fifth year, and thereafter no pruning for 5 years, produced an average annual yield of 1½ bushels more than trees subjected to the severe type pruning that is regularly used in Georgia. Types of pruning which involved heading back and thinning out were intermediate in the amount of wood removed in the pruning operation, and likewise were intermediate in the yield produced. There was a definite inverse relationship between the amount of wood removed and production. There were no significant differences in the size of the fruit produced with the different types of pruning. The lower labour requirement for pruning and the increased yields per tree greatly reduced production costs. [From authors' summary.]

7199. Zabranskaja, O. A., and Dorgobužina, K. D.
A biological basis for the pruning of cherry-plums. [Russian.] *Sadovodstvo*, 1965, No. 2, pp. 25-7, illus.

Crimean cherry-plum varieties may be divided into 3 groups, viz. *Prunus cerasifera*, *P. cerasifera taurica* and *P. salicina* × *P. cerasifera*, according to their pomological and botanical characteristics and also according to the shape of the crown. On trees with broom-shaped and intermediate crowns maximum yields were obtained by spring pruning all 1-year shoots by ½ to ⅓ of their length, combined with summer pruning. Yield increases were not obtained by this method of pruning on trees of the third, hybrid group with a crown shape similar to that of plum trees; it is recommended that this type of tree should be pruned in the spring.

7200. Semin, V. S., Kuželenko, V. G., and Alekseev, G. P.
A pruning study on plums with the aid of radiophosphorus. [Russian.] *Sadovodstvo*, 1965, No. 2, pp. 18-19.

In 3 years' studies on plum trees of 3 varieties 1-year shoots were pruned by ¼, ½ and ⅔ of their length. Control trees were not pruned. Radioactive P was applied in trenches around the trees, and radioactivity was measured in leaf samples taken from the top, middle and lower ends of the shoots and in the fruits. The leaf contents of the isotope, which were higher in pruned than in unpruned trees, increased during the vegetative period. Leaves higher in the crown or higher on the shoot had a higher P_2O_5 content than those lower down. Maximum amounts of radioactive P were found in leaves of shoots which had been pruned by ¼ of their length. The greatest total shoot length was obtained on trees with shoots pruned by ⅔ of their length. On unpruned trees larger quantities of the isotope accumulated in the leaves of fruiting shoots than in the leaves of vegetative shoots. On pruned trees, however, equal quantities were generally accumulated in both types of shoot, or sometimes larger amounts were found in the vegetative shoots.

Growth and physiology.

7201. Friedrich, G. (Editor).
Physiologisch Probleme im Obstbau. (**Physiological problems in fruit growing.**) [English summaries.] *Tagungsber. dtsche Akad. LandwWiss. Berlin* **65**, 1964, pp. 323, bibls, illus.

The second International Symposium was held at the Institute for Horticulture at Dresden-Pillnitz in October, 1963. Seventeen of the papers have been listed from another source [*H.A.*, 34: 4134]. Others (in German or Russian) are: The influence of the photoperiod on the growth and flower formation of fruit trees, by H. Streitberg; The influence of the photoperiod on some metabolic processes in apple leaves, by O. Henke; Preliminary investigations on phosphorus compounds in leaves and axillary buds on the long shoots of one-year-old apple and sweet cherry trees during flower differentiation, by S. Schmidt; Problems associated with methods of testing trees for frost resistance, by E. Schubert; Results of studies on winter hardiness of fruit plants in the non-chernozem zone of the R.S.F.S.R. [Russian], by V. G. Trušečkin; The water requirements, metabolic processes and winter hardiness of fruit trees [Russian], by M. A. Solvj'eva; The influence of rootstock and scion on the nitrogenous content of exudation sap, by L. Meyer; The problem of incompatibility of some pear varieties grafted on quince [Russian], by D. Krasnyj, E. Bumbak and G. Dumitresku; The influence of different soil factors on the branching density of fibrous roots of trees, by G. Otto; The initial development of mulched grass swards in relation to fruit tree growth and cultivation practice, by J. Baumeister; Possibilities of controlling fruit quality through manurial treatments, and the limiting factors, by G. Bünemann; The influence of Malling and *Malus baccata/prunifolia* rootstocks on the development of fruit flavour, by W. Blasse; The physiological importance of the leuco-anthocyanins and their quantitative determination, by. H. Nürnberger.

7202. Moore, C. S.
Inter-relations of growth and cropping in apple trees studied by the method of component analysis. *J. hort. Sci.*, 1965, **40**: 133-49, bibl. 5.

Pomological records taken on Cox's Orange Pippin and Worcester Pearmain were converted to new variates by the method of component analysis. The new variates, which were the weighted sums of the old, were expressions of physiological characteristics such as vigour, fruitfulness (or intensity of cropping) and apical dominance. A study of the new variates showed that vigour was correlated from year to year, but the correlation decayed with time; in particular, nursery vigour was little associated with field vigour. A nursery expression of apical dominance was found to be largely associated with nursery position and did not influence later growth and cropping. Later fruitfulness, which showed a tendency to biennial behaviour, was positively correlated with early vigour and negatively related to early severity of pruning. A further variate was determined chiefly by fruit set; it was associated with field position and with both fruitfulness and fruit set in the previous year. [Author's summary.]—E. Malling Res. Stat., Kent.

7203. Sarapuu, L. P.
The physiological effect of phloridzin as a β-inhibitor during growth and dormancy in the apple tree. [Russian, with English summary ⅓ p.] *Fiziol. Rast.*, 1965, **12**: 134-45, bibl. 26, illus.

Physiologically active substances were extracted from apple shoots, analysed by chromatography and bioassayed with wheat coleoptiles. When the shoots were growing they contained large amounts of growth stimulators and low amounts of inhibitors. As the leaves aged the amount of stimulators present became less and the amount of inhibitors increased. The content of free phloridzin was at a maximum at leaf fall. The content of free phloridzin was reduced by low temperatures, either those occurring naturally during winter or those artificially applied in early October. Phloridzin was decomposed by growing wheat coleoptiles, the decomposition products being different in the light and in the dark. An extract of enzymes from growing apple shoots was able to prevent the inhibiting action of phloridzin on coleoptile elongation. The further addition of IAA stimulated elongation, but IAA had little effect in the presence of phloridzin without the addition of phloridzin-decomposing enzymes. [For earlier work see *H.A.*, 35: 2792.]

7204. Pieniążek, J.
Kinetin induced breaking of dormancy in 8-month-old apple seedlings of "Antonovka" variety. [Polish summary ¾ p.] Reprint from *Acta agrobot.*, 1964, **16**: 157-69, bibl. 16, illus.

Kinetin applied at 100 and 200 μg./ml. to the petioles of dormant apple seedlings in the greenhouse induced bud-break and new growth, whereas the untreated plants remained dormant. The subsequent growth of treated, unchilled plants, however, was stunted. Basipetal transport of the kinetin extended to 20 cm. or more in those seedlings which retained their lower leaves. The treated plants showed new vascular tissue in the form of an irregular cylinder along their whole length, and the new shoots showed distortion of the primary xylem. The best response, i.e. the development of vigorous, normal shoots, was obtained with partially chilled, dormant seedlings which had shed all their leaves before treatment.—Inst. Pomol., Skierniewice.

7205. Kaliničenko, R. I.
The duration of the dormant period in pears. [Russian.] *Vestn. sel'sk. Nauki*, 1965, **10**(3): 94-8, bibl. 15.

Studies on trees of 10 pear varieties in the Soviet Far East showed that the dormant period began when the growth processes ceased, i.e. at the end of July or in August depending on variety. By September a state of deep dormancy was observed in all varieties. During the period January-March the trees were in a state of induced dormancy, and they remained frost resistant until the temperatures became high enough to induce growth. The colder the autumn the earlier was dormancy broken. On individual shoots fruit buds became dormant before vegetative buds. No relationship was found between winter-hardiness and the depth or duration of the dormant period. Late varieties did not always have the longest period of dormancy.

7206. Tétényi, P.
Fás növények nyugalmi állapotának összefüggése a légzéssel és foszforanyagcserével. **(The relationship between the rest period of woody plants and respiration and phosphorus metabolism.)** [English and Russian summaries ½ p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 135-47, bibl. 24.

Respiration and changes in the nucleic acid content during dormancy were studied in the seeds and buds of 3 apricot varieties. Respiratory activity and nucleic acid content were high in the embryo from the time of fruit set until the beginning of ripening, and dropped sharply thereafter when the embryo entered into dormancy. In the buds the low respiratory activity and nucleic acid content found at the end of the summer were indicative of the start of dormancy. The low level of respiration stopped the course of energy production (ATP) and this stopped growth. [See also *H.A.*, 33: 4503.]

7207. Kask, K.
The effect of day length on the growth and over-wintering of apricot and peach seedlings. [Russian, with English and Estonian summaries ¾ p. each.] *Izv. Akad. Nauk Est. SSR, Ser. biol.*, 1965, **14**: 120-9, bibl. 22, illus.

Apricot and peach seedlings from seeds stratified at alternating or constant temperatures [see *H.A.*, 35: 358] were grown for one year in 12-hour days throughout, in 12-hour days for 1–1·5 months after emergence and natural days thereafter, in natural days for 1–1·5 months and 12-hour days thereafter, and controls in natural days throughout. Seedlings of both species grown in 12-hour days throughout were taller in the second and subsequent 2–3 years than the controls, but those grown in natural+12-hour days were almost as tall. Seedlings grown in 12-hour+natural days were similar to the controls. Differences in seedling growth from seeds stratified at alternating and constant temperatures were barely discernible by the end of the second year, with the exception of one apricot variety, the growth of which was stimulated by alternating seed treatment. The frost resistance of the seedlings was in the following descending order of treatments: natural+12-hour days, controls, 12-hour+natural days and 12-hour days throughout.

7208. Čajlahjan, M. H., and others.
The dormant period and changes in the contents of physiologically active substances in peach seedlings. [Russian, with Armenian summary ⅓ p.] *Doklady Akad. Nauk Arm. SSR*, 1965, **40**: 243-7, bibl. 12.

Tissue extracts taken after dormancy from the bark and buds of peach seedlings, which had been over-wintered at low and high temperatures, were chromatographed, bio-assayed and tested for colour reaction. Compared with plants that had been over-wintered at a high temperature, plants that had been exposed to cold had a higher content of gibberellins but a lower content of a phenolic growth-stimulating compound; the growth-stimulating activity of this phenolic compound, however, was increased. In the plants exposed to cold the content of the growth inhibitor naringenin was reduced to a level at which it exerted a stimulating action on growth, whereas in the plants exposed to high temperatures the content of naringenin was high and exerted a growth-inhibiting effect. [For related work see *H.A.*, 33: 337.]

7209. Ghena, N., and others.
Unele caractere biochimice la două soiuri de piersic în timpul vegetaţiei şi al stării de repaus. **(Some biochemical characteristics of two peach varieties during the growing and dormant seasons.)** [English and German summaries ⅓ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 65-74, bibl. 4.

The seasonal trends in composition were similar in the early variety Mayflower and the late variety Elberta, but in Mayflower the protein content of the tissues was higher, and the carbohydrate content lower, than in Elberta.

7210. Chirilei, H., Ghena, N., and Dorobanţu, N.
Unele aspecte fiziologice la soiurile de piersic Floare de Mai şi Elberta în cursul perioadei de vegetaţie. **(Some physiological characteristics of the peach varieties Mayflower and Elberta during the growing season.)** [English and French summaries ¼ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 57-63, bibl. 3.

The rates of transpiration, photosynthesis and respiration were determined at short intervals between 24 April and 25 September. In general, the rates of transpiration and respiration were higher in the early variety Mayflower, but photosynthetic activity was greater in the late variety Elberta.

7211. Sirois, D. L., and Cooper, G. R.
The influence of light intensity, temperature and atmospheric carbon dioxide concentration on the rate of apparent photosynthesis of a mature apple tree. *Bull. Me agric. Exp. Stat.* **626**, [1964?], pp. 36, bibl. 43, illus.

A fuller account of work abstracted in *H.A.*, 35: 2786.

7212. Quinlan, J. D.
The pattern of distribution of ^{14}carbon in a potted apple rootstock following assimilation of ^{14}carbon dioxide by a single leaf. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 117-18, bibl. 8, illus.

A technique is described for using $^{14}CO_2$ and autoradiography to examine the movement of assimilates from single leaves of an apple rootstock. From upper leaves movement was predominantly to the stem tip, while from lower leaves movement was largely down to the root system. From a leaf in an intermediate region movement was both upwards and downwards. [Author's abstract.]

7213. Sahulka, J.
Electrophoretic assay of protein extracts from apple-tree blossoms and leaves. *Biol. Plant., Prague*, 1965, **7**: 165-8, bibl. 7, illus.

The X fraction was present in leaf extracts, absent from flower extracts but present in the extracts of flower buds because these contain primordia of both flowers and leaves.—Inst. exp. Bot., Prague.

7214. Petrov, A. A.
Some characteristics of the fruiting shoots of plums and apricots. [Russian.] *Agrobiologija*, 1965, No. 1, pp. 94-100, illus.

The morphology and development of fruit and leaf buds on the fruiting shoots of plums and apricots, which have sympodial branching, were compared with those of peaches and almonds on the one hand and with sweet and sour cherries on the other hand, all of which have monopodial branching.

7215. Jones, O. P.
Observations on the growth effects of xylem sap from apple trees. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 119-23, bibl. 18.

A method is described for the sterile culture of apple shoot tips, and preliminary results are presented comparing the effects of apple xylem sap on cultures of isolated tobacco pith and of apple shoots. The sap appears to promote cell division in the pith tissue, but it inhibits shoot growth. Possible implications of these results are discussed. [Author's abstract.]

7216. Savel'eva, L. S., and Isaeva, T. L.
Root secretions and the growth of seedlings of tree species. [Russian.] *Vestn. sel'sk. Nauki*, 1965, **10**(4): 132-6, illus.

Laboratory studies are reported on the influence of root secretions on the growth and development of potted seedlings of a number of tree species, namely apricot, false acacia, oak, elm and wild pear. Seedlings of each species were treated with secretions from the roots of each of the 5 test species. Controls were treated with water. In most cases seed germination and initial growth were stimulated by treatment, but later the growth of the treated seedlings was considerably less than that of the controls. Apricot seedling growth tended to be reduced by treatment throughout the trial. The nodule bacteria on the roots of treated acacia seedlings disappeared.

7217. Ghena, N.
Cercetări privind arhitectonica sistemului radicular al părului, mărului, caisului şi cireşului în condiţiile solului cernoziom levigat—Istriţa. **(Studies on the structure of the root systems of apple, pear, apricot and sweet cherry trees grown on a degraded chernozem soil at Istriţa.)** [English and Russian summaries 1 p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 37-45, bibl. 6.

The skeletal and horizontal roots of pear trees on quince rootstock were located mainly at a depth of 20–40 cm., the vertical roots penetrating to 2–3 m. The roots of pear on wild pear rootstock were thicker and less branched than those of pear on quince, the horizontal roots being located mainly at a depth of 40–60 cm. and the vertical roots penetrating to 3·5 m. The horizontal roots of apple on paradise stock were 1–8 mm. thick and were mainly at a depth of 20–40 cm.; the vertical roots reached a depth of 1·5 m. Apricots on cherry-plum stock had well branched root systems reaching depths of 2–2·5 m. Cherries on mahaleb stocks were characterized by root systems well developed both horizontally and vertically and by thick skeletal roots (15–50 mm.) mainly in the 20–60 cm. zone.

7218. Head, G. C.
Studies of diurnal changes in cherry root growth and nutational movements of apple root tips by time-lapse cinematography. *Ann. Bot., Lond.*, 1965, **29**: 219-24, bibl. 9, illus.

Analysis of time-lapse films of growing roots, photographed through plate-glass windows, showed that cherry root growth was most rapid between 16.00 hours and 23.59 hours daily and was slowest between 08.00 hours and 16.00 hours, and that apple root tips exhibited rhythmic nutational movements as they grew through the soil. [Author's abstract. See also *H.A.*, 35: 441.] —E. Malling Res. Stat., Kent.

7219. Voronova, T. G.
The rhythm of root growth in fruit crops in relation to the development of their aerial parts. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 291-3.

Studies over a 3-year period are reported on the root growth and top growth of apple and pear trees grafted on different rootstocks, and of cherry and plum trees which were either grown on their own roots or grafted on black-fruited rowan (*Sorbus* sp.). All the species showed 5 waves of growth of the active roots during the vegetative period, except for cherry and plum trees grafted on rowan rootstocks which showed only 4. No direct relationship was observed between the growth of active roots and flowering, the rhythm of root growth being similar in both flowering and non-flowering trees.

7220. Tamási, J.
A talajvíz mélységének hatása az almafák gyökérzetére. **(The effect of the soil water table on the root system of apples trees.)**
A talajvíz hatása az almafák gyökérzetének alakulására. **(The effect of soil water on the formation of the root system of apple trees.)** [English and Russian summaries 1¼ pp. each.] *Magy. Tud. Akad. Közlem.*, 1964, **23**(1/2): 25-41, from *Hung. agric. Rev.*, 1965, **14**, Abstr. 48; and *Kísérl. Közlem., Sect. C*, 1964 (issued 1965), **57**C(1): 51-71, bibl. 4, illus.

Root growth and distribution were studied in 4-year-old Jonathan trees on M.IV grown in sandy soils with different soil water levels. Under conditions of a high soil water table (50–60 cm. in the spring and 80–90 cm. in the summer) growth was more vigorous than when the soil water table was low (150 cm. in spring and 220 cm. in summer), but the majority of the roots (73%) were located in the 10–30-cm. layer of soil, anchorage was poor and the leaves became chlorotic. The best soils for apples on M.IV were those in which the water table did not rise above 100–120 cm. below the surface.

7221. GHENA, N.
Contribuţii la studiul sistemului radicular al prunului cultivat pe solul brun-roşcat de pădure Băneasa. **(A study of the root systems of plum trees grown in reddish brown forest soil at Băneasa.)** [English and Russian summaries ½ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 29-36, bibl. 6.

The root systems were examined of 10-year-old plum trees of the varieties Giant, Louvain Beauty, Tuleu gras, Red Nectarine and Anna Späth on myrobalan rootstocks. Most of the framework and horizontal roots were at a depth of 20–25 cm. Red Nectarine, Anna Späth and Louvain Beauty had the best developed root systems. It is recommended that fertilizers should be placed deeply to encourage deep rooting, and that tillage should be shallow to avoid damage to the framework roots.

7222. LLEWELYN, F. W. M.
The effect of spray damage on apple leaf movements as shown by time-lapse photography. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 129-32, bibl. 2, illus.

A description is given of the movement of leaves occurring throughout the day on the shoot tips of MM.106 apple rootstocks in a greenhouse. The movements have a daily rhythm which depends upon the age of the leaf, and appear to be due chiefly to changes in the pulvinus. They are inhibited by spray damage to the leaf. The effect of a flash of light every 15 min., day and night, was to increase 4-fold the area of the leaves developing at that time. [Author's abstract.]

7223. EDWARDS, G. R., AND JONES, O. P.
The growth of apple leaf discs. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 140-2, bibl. 5.

A technique is described for growing discs of apple leaves under sterile conditions. The discs showed marked responses to sucrose, inorganic salts and gibberellic acid. The potential of the technique for the study of exogenous and endogenous leaf-growth controlling factors is discussed. [Authors' abstract.]

7224. BEAKBANE, A. B.
Some effects of gibberellin on the anatomy of apple leaf discs. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 102-3, bibl. 5, illus.

Effects on leaf anatomy, apparently induced by gibberellin, are described and related to disc expansion during a 4-day period of treatment of leaf discs in a growth chamber. Some expansion of epidermal cells took place in the water and basic culture medium controls, but expansion was greatest in the basic medium plus GA at 0·5 p.p.m. The distribution and shape of mesophyll cells were also affected by the addition of GA to the culture medium. Attention is drawn to similarities in mesophyll structure between normal, untreated leaves of very dwarfing apple rootstocks and leaf discs of a rootstock of intermediate vigour treated with GA. [Author's abstract.]

7225. EDGERTON, L. J., AND BLANPIED, G. D.
Results of the new growth retardant B995 on apples trees. *Proc. N.Y. St. hort. Soc., 1965*, [1965], **110**: 161-70, bibl. 4, illus.

Applications of B-995 (N-dimethylaminosuccinamic acid) to Red Delicious trees a month after flowering checked shoot growth and increased flowering compared with the untreated controls. Applications made in the autumn, or in the spring to the opening flower buds, delayed full bloom by 1–5 days. Spraying at the pink-bud stage increased both fruit set and frost resistance, but reduced fruit size in most of the varieties tested. August applications considerably increased fruit colour on McIntosh apples, and size at harvest time was unaffected. Treatment of a number of varieties in late May or June resulted in firmer fruits compared with those on untreated trees. The effects lasted throughout storage and the treatment increased shelf life. Some reduction in storage scald was also noted. Fruits from trees sprayed with B-995 and 2,4,5-T, separately or together, to control pre-harvest drop were firmer than the controls.—Cornell Univ., Ithaca, N.Y.

7226. BATJER, L. P.
Progress report on the use of B-Nine on fruit trees. *Proc. Wash. St. hort. Ass., 1964*, [1965], pp. 27-8.

The growth of apples, pears and cherries was effectively reduced by sprays of B-Nine. Other effects included considerable increases in bloom in the following year, the control of pre-harvest drop, improvement in fruit colour, earlier maturity in cherries but not in apples, increased firmness of apples after storage and a reduction in the incidence of storage scald in Delicious apples. Concentrations of 2,000 p.p.m. or more caused a moderate reduction in apple size; this effect was carried over into the next season. The year following treatment the fruit stem length of Golden Delicious and Beacon apples was reduced. Sprays applied for a second consecutive year on Delicious apples and Anjou pears were much less effective than those applied in the first year. [See also *H.A.*, 35: 2784, 5144 and 5180.]—Wash. St. Univ., Wenatchee.

7227. PROEBSTING, E. L.
Progress report on the use of growth retardants on soft fruits. *Proc. Wash. St. hort. Ass., 1964*, [1965], pp. 25-6.

An autumn application of B-995 to sweet cherry trees delayed flowering but did not increase hardiness. Yields of 5–7-year-old trees were doubled or trebled, but fruit size was reduced as a result of the heavier yield. Earlier ripening was observed on treated sweet cherries and to some extent on Early Italian prunes. The soluble solids content of prunes treated with B-995 was increased. After 2 weeks' storage at 35° F. prunes treated with B-995 developed a watery breakdown within 4 days at room temperature, whereas untreated fruits could be held for 10 days after storage.—Wash. Irrig. Exp. Stat., Prosser.

Flowering, pollination and fruit set.

(*See also* 6877.)

7228. Petrov, A.
The initiation and development of floral organs in fruit trees. [Bulgarian.] *Grad. lozar. Nauka*, 1965, **2**: 137-46, bibl. 122.

A review.

7229. Fulford, R. M.
Regular and irregular bearing in fruit plants. *A.R. E. Malling Res. Stat., 1964*, 1965, **A48**: 71-82, bibl. 143.

Factors which affect the yield of fruit plants are considered in relation to their effects on different stages of crop development. The effects of vegetative growth upon flower initiation, and the variation in rate of development of the sex cells due to climatic and cultural factors, are discussed. Other aspects reviewed include the relative importance of different pollinating agents, the effect of climate upon fruit setting, and changes in the pattern of cropping due to pruning, etc. It is concluded that regular cropping depends upon the maintenance of a balance of many factors. [Author's abstract.]

7230. Vitkovskij, V. L.
The multiple flowering of fruit trees in the light of the theory of the phasic development of plants. [Russian, with English, German and French summaries ¼ p. each.] *Vestn. sel'sk. Nauki*, 1965, **10**(3): 99-104, bibl. 42, illus.

Buds of fruit trees and plants form central and axillary growing points. The central growing point differentiates into the floral organs throughout the summer, autumn and winter, while the axillary growing points remain dormant. In the following spring and summer the axillary growing points begin to differentiate, forming new buds as they pass through a second developmental phase known as the light phase. Under favourable environmental conditions the plant may flower repeatedly. [See also *H.A.*, 33: 6771.]

7231. V'junov, S. F.
Flower formation in apples. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 55, pp. 130-2.

On 6 young trees each of 8 apple varieties 2 shoots were ringed on 13 or 14 May. From these ringed shoots all the leaves were removed in succession on 15 May, 3 and 19 June, 4 and 18 July, or 8 August, and the buds were examined on these dates and also on 8 October. Examinations on the first 3 dates (May and June) revealed no anatomical signs of flower formation, and shoots defoliated on these dates did not produce flower buds. Examinations on the 3 later dates of defoliation showed a high percentage of flower buds, the number of which had increased by 8 October. Late defoliation, therefore, did not arrest incipient flower bud development.

7232. Kolin'ko, T.
Apricots can fruit annually. [Russian.] *Sadovodstvo*, 1965, No. 5, p. 21.

The differentiation of apricot fruit buds is described. Trees which were pruned in early June and irrigated and fertilized in mid-June and August produced higher yields both in the year of treatment and in the following year than the untreated controls.

7233. Šajtan, I. M., and Kleeva, R. F.
The viability of the pollen of some fruit crops. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 55, pp. 38-41, illus.

Apple pollen stored in a desiccator for one year did not germinate on an artificial medium (1% agar and 10–15% sugar), but when applied to the stigma of another variety about 9% germination was obtained. Apricot and peach pollen stored for one year did not germinate either on an artificial medium or on a stigma. One-year-old vine pollen used in cross-pollination trials gave a 10–20% set of berries with normal seeds. Vine flowers pollinated 2–3 days after emasculation gave a higher percentage of fruit set than those pollinated 8–9 days after emasculation.

7234. Barritt, B. H., and Eaton, G. W.
Retarded embryo sac development in irradiated clones of *Malus silvestris* Hort. cv. "Golden Delicious". *Nature*, 1965, **207**: 546.

Seven apple clones propagated from buds irradiated at 5,000 r. from a Co^{60} source were selected for high, intermediate and low pollen abortion. Abortion was 4·9% in a typical control clone, and varied in the irradiated clones from 10·4% to 84·8%. A highly significant negative correlation was found between the percentage pollen abortion and the number of differentiated 8-nucleate embryo sacs; as abortion increased, relatively more embryo sacs preceded the 8-nucleate stage.—Univ. B.C., Vancouver.

7235. Uitterlinden, L.
Hogere kg-opbrengst bij Stark Earliest door betere bestuiving. **(A higher kg. yield from Stark Earliest by better pollination.)** *Fruitteelt*, 1965, **55**: 542-3, illus.

The times of flowering were compared for Stark Earliest and several popular apple varieties over a number of seasons. James Grieve proved the most effective pollinator in most years, and a suitable interplanting lay-out is shown using this variety in orchards of Stark Earliest. In practice, a ratio of one pollinator to 6 trees has proved satisfactory.—R.T.C., Barendrecht.

7236. Free, J. B.
Attempts to increase pollination by spraying crops with sugar syrup. *J. apic. Res.*, 1965, **4**: 61-4, bibl. 15.

More honeybees visited plots of apples and field beans after these had been sprayed with sucrose syrup, but nearly all the bees collected syrup rather than nectar and pollen. Fewer bees visited the flowers in sprayed than in unsprayed plots, and less fruit was set. The effect of spraying was very local and did not increase the number of bees visiting the flowers elsewhere on the crop. [From author's summary.]—Rothamsted exp. Stat., Harpenden.

7237. Mittempergher, L., Aradski, M., and Fideghelli, C.
Studi sulla microsporogenesi e sul corredo cromosomico di alcune cultivar di pero provenienti da incrocio. **(Studies on microsporogenesis and chromosome complements of certain pear varieties derived from hybridization.)** [English summary 9 lines.] *Riv. Ortoflorofruttic. ital.*, 1965, **49**: 171-85, bibl. 11, illus.

In the 13 diploid hybrid pear varieties studied pollen formation generally took place early in March in the regions of Florence and Rome, but began as much as a month earlier when the temperature rose above 12° C. for 5–7 days during the late winter. With one exception the order of flowering in the varieties studied was the same as that of pollen formation.—Centro Miglior. Piante, Firenze.

7238. Zielinski, Q. B.
Self-incompatibility of *Pyrus* species. *Bull. Torrey bot. Cl.*, 1965, **92**: 219-20.

Pyrus faurei was the only one of 15 pear species to set seed from artificial self-pollination.

7239. Cambra, M.
Determinación de variedades polinizadoras del peral "Ercolini" (Coscia). **(The selection of pollinators for the pear variety Ercolini (Coscia).)** [English summary 5 lines.] *An. Estac. exp. Aula Dei*, 1964, **7**: 160-4, bibl. 5.

Self-pollination of Ercolini pears resulted in a fruit set of only 3%. With pollen from the varieties Monsallard, Bonne Louise d'Avranches and Leonardeta the figures were 28, 26 and 23% respectively. The highest percentage of all (figure not stated) was obtained with pollen of the variety Abate Fetel (Abbé Fétel).

7240. Vrettas, D. A.
The effect of auxins and gibberellins on the fruiting of pear trees. [Greek, with English summary ¾ p.] *Doctoral Thesis Arist. Univ. Thessalonika*, 1964, pp. 46, bibl. 31, illus.

Emasculated flowers on branches of pear trees of the varieties Tsaconica, Kontopodarussa and Coscia were sprayed at full bloom with the K salt of GA at 25, 50 and 100 p.p.m., or with 2-naphthoxypropionic acid (2-NOP) at 100 p.p.m., or with a mixture of the last named with 50 p.p.m. GA. In each case a wetting agent was added. The seedless fruits resulting from the application of 50 and 100 p.p.m. GA were as heavy as, or heavier than, the normal fruits from open pollination. Swellings developed at the calyx end of the GA-treated fruits, the extent of the deformity and the percentage of deformed fruits being positively related to the concentration. Kontopodarussa was the variety most affected. The effects of GA at 25 p.p.m. were greater than those of 2-NOP at 100 p.p.m. Total fruit set was increased and the number of seeds per fruit decreased by spraying during open pollination with 50 p.p.m. GA. Here also 100 p.p.m. 2-NOP was less effective. Some terminal buds of Tsaconica were modified into thorns and some fruitlets of Kontopodarussa developed anomalous petals in response to GA. Fruit flavour and ripening date were not affected by the treatments.

7241. Uitterlinden, L.
Gibberellazuur op Triomphe de Vienne. **(Gibberellic acid on Triomphe de Vienne.)** *Fruitteelt*, 1965, **55**: 419-20, bibl. 1, illus.

Blossom sprays of GA, used to improve fruit set on Triomphe de Vienne pears, were found to reduce flower bud initiation. A low concentration of GA (1 tablet [amount not stated] in 40 l. or 80 l. of water) was adequate to improve fruit set in favourable seasons and caused much less reduction of flower bud initiation than a concentration of 1 tablet in 10 l. of water. The best time for spraying extended from the start of flowering (when 20% of the flowers were open) to full bloom (when the first petals started to fall). [See also *H.A.*, 35: 5158.]—R.T.C., Barendrecht.

Fruit thinning, development and drop.

(*See also* 7188, 7478.)

7242. Wilking, E.
Zeitbedarf und Erfolg beim Handausdünnen von Äpfeln. **(The time requirements and results of hand thinning apples.)** *ErwObstb.*, 1965, **7**: 113-16, bibl. 3, illus.

In experiments with 6 varieties increased fruit size was obtained by vigorous thinning of excessively heavy crops. The expense was only partly covered by the greater ease of harvesting, but thinning also simplified preparation for market, as fruit size was more uniform. Experimental data are presented for the 6 varieties. For Cox, for example, the figures for thinned (and unthinned) bush trees were: 578 fruits thinned at the rate of 18·83 min./100 kg., time spent in picking 39·33 (42·12) min./100 kg., yield 109·7 (122·5) kg./tree, number of fruit harvested 979 (1,492), number of fruit/100 kg. 899 (1,209), fruit under 60 mm. as % total number 9·1 (39·4), 60–65 mm. 38·3 (47·7), 65–70 mm. 39·2 (11·0), 70–75 mm. 12·2 (1·5) and 75·80 mm. 1·2 (0·4).—Inst. Obstb. Baumsch., Sarstedt.

7243. Hohmann, G.
Über die Fruchtausdünnung mit chemischen Mitteln bei verschiedenen Apfelsorten. **(Fruit thinning of various apple varieties with chemical materials.)** *ErwObstb.*, 1965, **7**: 69-74, bibl. 4, illus.

Thinning with several chemicals, applied by syringe or by a tractor-drawn sprayer, was compared with hand thinning in a 2-year trial. Thinning reduced fruit set, on average, by 14% in the year of treatment, and increased flower number by 23% in the following year. The yield per tree was reduced by 8–31% by the chemicals and by 10% with hand thinning. As an average of all thinning treatments there was a mean fall in fruit number of 28%, but this was offset by an increase of 20 g. (24%) in mean fruit weight, compared with unthinned trees. The size increase led to a greater proportion of fruit in the over-65 mm. classes, especially in James Grieve, and this raised the price. The cash yield per ha. was greater with thinning than without, provided the yield reduction did not exceed 15%. Hand thinning gave the higher cash yield per ha. with James Grieve, Jonathan and Golden Delicious, and chemical thinning with Klarapfel, Goldparmäne and Cox. The cash yield per ha. was higher with the sprayer than with the syringe, because the yield reduction was less and the fruit size better. Geramid was mild in action and consequently suitable for sensitive varieties; Shellestone had a stronger effect and successfully thinned the very resistant Goldparmäne; Preparation 24a resulted in more or less severe scorching on almost all varieties.—Inst. Obst., Univ. Bonn.

7244. Spartsis, N. I.
Fruit thinning in apple and peach varieties by chemical and mechanical means. [Greek, with English summary 1 p.] *Doctoral Thesis Arist. Univ. Thessalonika*, 1964, pp. 60, bibl. 49, illus.

Sevin and NAA were used for thinning the apple varieties Delicious and Abbondanza, and NPA for the peach varieties Elberta, Morettini No. 1, Jerseyland and Golden Jubilee. On apples the optimal fruit set was 5–12% and on peaches 15–34%, depending on flowering intensity and tree size. Chemical thinning at moderate application rates improved fruit size and shoot growth, and early thinning reduced the June drop. Peach fruits on treated trees ripened 2–8 days before the controls, and both the harvesting period and the time spent in sorting and grading were reduced. In Golden Jubilee and Jerseyland peaches the ratio of stone weight to total fruit weight was reduced. Treated apple trees had a lower percentage of fruit drop than treated peach trees. Cold, damp weather during fruit set increased fruit drop from both treated and untreated trees and reduced the differences between them. Abbondanza apples responded best to NAA at 10–60 mg./l. applied 5–24 days after full flowering. For Delicious, 0·1–0·3% Sevin applied 8–24 days after full flowering gave the best results. The peach varieties Morettini 1 and Jerseyland were best thinned 4–15 days after full flowering with NPA at 200–600 mg./l. For Elberta and Golden Jubilee the best rates were 100–400 and 100–200 mg./l. and the periods 4–7 and 4–14 days, respectively. Leaf epinasty developed on apples at high rates of NAA and on peaches at high rates of NPA. In severe cases shoot elongation and fruit growth were checked. In Delicious apples the reduction in the number of seeds per fruit and the increase in the percentage of seedless fruits were greater with Sevin than with NAA. In one case NPA at 400 mg./l. deformed some Elberta fruits. Observations in the third experimental year showed that the optimal number of leaves per fruit was 23–27 in Abbondanza, 30–53 in Delicious and 23-57 in the peaches. The effectiveness of both NAA and NPA was reduced by hot, dry weather and increased by cold, damp weather. In the tables of data the effects of hand thinning are included.

7245. Nagasawa, K., Ono, M., and Takahashi, E.
Studies on chemical sprays for the thinning of peaches. 1. The effects of several chemical sprays for the thinning of peaches. [Japanese, with English summary ⅓ p.] *Tech. Bull. Fac. Hort. Chiba*, 1964, No. 12, pp. 21-9, bibl. 16.

Trials are reported in which trees of 2 peach varieties were sprayed with various concentrations of dinitro methylpropyl phenolate (DNBP), dinitro cyclohexyl phenol acetate (DN), naphthyl phthalamic acid (Peach-thin), chlorophenoxypropionic acid (3CP) and NAA at intervals before, during and after full bloom. DN at 200 and 400 p.p.m. had no appreciable effect, but at 800 p.p.m. it resulted in over-thinning. Sprays of 3CP and NAA were ineffective. Peach-thin at 200 p.p.m. gave satisfactory results in 1 year but resulted in over-thinning in the next year. No apparent injury was caused by any of the sprays except DNPB at 800 p.p.m.

7246. Sterling, C.
Comparative morphology of the carpel in the Rosaceae. V. Pomoideae: *Amelanchier, Aronia, Malacomeles, Malus, Peraphyllum, Pyrus, Sorbus.* *Amer. J. Bot.*, 1965, **52**: 418-26, bibl. 11, illus.

These genera have in common a cartilaginous or membranous endocarp. [For part II see *H.A.*, 35: 438.]

7247. Avent, K. L.
Fruit drop of cling peaches. *Vict. Hort. Dig.*, 1965, **9**(1): 23-6, illus.

The factors influencing the falling of semi-ripe fruit were investigated, using records for 7 peach varieties over 4 seasons. Varietal susceptibility and a tendency towards later picking appeared to be the main causes.—Hort. Res. Stat., Tatura.

Fruit quality and composition.

(*See also* 6988, 7017, 7620.)

7248. Prodan, G.
Buletine pentru aprecierea calităţii fructelor seminţoase şi fructelor sîmburoase prin degustare. **(Advice on the estimation by tasting trials of the quality of pome and stone fruits.)** [French and German summaries ¾ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 97-110, bibl. 6.

The author lists the characteristics used in a new system of evaluating fruit quality by tasting panels. Points are awarded for fruit shape, size, appearance and consistency, as well as for flavour.

7249. Yeatman, J. N., and Norris, K. H.
Evaluating internal quality of apples with new automatic fruit sorter. *Food Technol.*, 1965, **19**(3): 123-5, bibl. 6, illus.

The sorter described measures the light transmitted through an apple at 2 selected wavelengths, computes the difference in optical density and ejects the fruit into one of 5 trays. A direct relationship was found between the chlorophyll content of individual apples and the light transmission difference measurements. The firmness and eating quality of automatically sorted Golden Delicious, Stayman, Rome and Winesap apples were studied; low-chlorophyll fruits were found to be of significantly superior quality and slightly firmer than high-chlorophyll fruits, even after 6 months' storage.—U.S.D.A., Beltsville, Md.

7250. Kalášek, J., and Blaha, J.
Sortierungsversuche mit Pfirsichsorten. **(Grading tests with peach varieties.)** [English, French and Spanish summaries 7-8 lines.] *Mitt. Klosterneuburg, Ser. B*, 1965, **15B**: 145-50, bibl. 1.

Tabulated data on the percentage of fruit in each of 3 market grades for 76 peach varieties.

7251. Skene, D. S.
Cracking and russeting in apple fruits. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 99-101, bibl. 3, illus.

Features of fruit skin structure affecting the initiation and development of russeting and cracking in apple fruits are described. The initiation of russeting in young fruitlets frequently appears to be associated with the presence of dead cells in the epidermis and of fine cracks in the cuticle. The distribution of cracking and russeting in "king" and axillary fruits is examined in relation to the pattern of growth in surface area. Variations in growth rate may account for the time at which cracking and russeting occur, but not for their distribution over the fruit surface. [Author's abstract.]

7252. Hochapfel, H.
Die Ursachen der Fruchtschalenberostung bei Äpfeln vor allem bei der Sorte Golden Delicious. **(Causes of apple fruit russeting, with particular reference to the variety Golden Delicious.)** Reprint from *Bad. Obst- u. Gartenb.*, 1963, **56**: 493-4.

The critical period for russeting due to spring frosts is between the pink-bud stage and about 3 weeks after blossoming. Golden Delicious is particularly susceptible because the oil content of its cuticle is lower than that of other varieties, and the fruit may russet even if temperatures do not fall below freezing point. Organic fungicides for scab control accentuate russeting if applied after low temperatures, and insecticides can also aggravate the condition. Russeting can be regarded as a climate-induced varietal characteristic of Golden Delicious.—Inst. Obstkrankh., Heidelberg.

7253. Whitfield, A. B.
A note on the concentration of major nutrient elements in Cox's Orange Pippin apples. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 148-9, bibl. 5.

Total N, P, K, Ca and Mg, expressed as mg. per 100 g. fresh weight, were determined on the cortical tissue of samples of Cox's Orange Pippin apple fruits from 40 commercial orchards: the mean levels and extent of variation are given. N was the most variable element. K values were very uniform and appeared to be unrelated to the size of crop. [Author's abstract.]

7254. Osborn, R. A.
Chemical composition of fruit and fruit juices. *J. Ass. off. agric. Chem., Wash.*, 1964, **47**: 1068-86, bibl. 4.

Data are presented for contents of soluble solids, total sugars, ash, K_2O and P_2O_5 and acidity for fruits and juice of apple, apricot, black and red raspberries, blackberry, cherry, crabapple, cranberry, red currant, damson, elderberry, Kadota fig, gooseberry, Concord grape, guava, loganberry, peach, pineapple, plum, quince, Seville orange and strawberry.

7255. Reig Feliú, A., and Albert Bernal, A.
Industrialización del albaricoque. 1. Caracterización, tratamiento frigorífico, congelación y conservación con SO_2 de las variedades Canino y Bulida, esta última sobre diferentes patrones. **(Industrial handling of apricots. 1. Characteristics, cold storage, freezing and preservation with SO_2 of the varieties Canino and Bulida, the latter on different rootstocks.)** *Bol. Inst. nac. Invest. agron., Madrid*, 1964, **24**: 287-325, bibl. 15.

Apricot production figures are quoted for all the producing countries. In the tests described, Canino was grown on apricot rootstocks in Valencia, and Bulida on both apricot and plum rootstocks in Murcia and on apricot in Valencia. The tabulated data show that fruit size, Brix, acidity, density, firmness and especially viscosity were affected by climate and soil (locality); that the varieties differed inherently in their contents of sugar, vitamin C and soluble solids, Bulida being the more suitable for juice extraction; and that the fibre content of the fruit was influenced by the rootstock, plum giving higher values than apricot. For cold storage 3° was preferable to 5° C., and the periods of economic storage life were 3 and 4 weeks for Bulida and Canino, respectively.—Estac. naranj., Levante.

7256. Srivastava, R. P., and Srivastava, K. K.
Ascorbic acid content of some important commercial varieties of temperate fruits. *Sci. and Cult.*, 1965, **31**: 140-1, bibl. 1.

The ascorbic acid contents are tabulated for 2 varieties of cherry, 5 of plum, 4 of apricot, 2 of peach, 2 of strawberry and 10 of apple. [See also *H.A.*, 34: 2308.]

7257. Samorodova-Bianki, G. B.
Flavonoids as natural antioxidants of ascorbic acid in fruits and berries. [Russian, with English summary ½ p.] *Biohimija*, 1965, **30**: 248-54, bibl. 15.

Several varieties of apple, pear, sour cherry, strawberry, gooseberry, black currant and actinidia were used in these experiments. A direct relationship was found between the flavonol and ascorbic acid contents, and an inverse relationship between ascorbate oxidase activity and the concentration of flavonols and particularly of their aglycones.

7258. Meynhardt, J. T., Maxie, E. C., and Romani, R. J.
Isocitritase in ripening Bartlett pear fruit tissue. *S. Afr. J. agric. Sci.*, 1965, **8**: 291-2, bibl. 5.

The characterization of isocitritase activity in an extract of the tissue.

7259. Hulme, A. C., Jones, J. D., and Wooltorton, L. S. C.
The respiration climacteric in apple fruits. Biochemical changes occurring during the development of the climacteric in fruit on the tree.
Jones, J. D., Hulme, A. C., and Wooltorton, L. S. C.
Idem. Biochemical changes occurring during the development of the climacteric in fruit detached from the tree. *New Phytol.*, 1965, **64**: 152-7, bibl. 6; and 158-67, bibl. 5.

The first paper deals with changes in the activity, in terms of O_2 uptake and CO_2 output in the presence of malate and succinate substances and of succinic and malic dehydrogenases, diaphorase and cytochrome-*c* reductase, of mitochondrial preparations from the peel and pulp of apple tissue. There was a general increase in activity beginning in peel tissue. Oxidative phosphorylation by the mitochondrial preparations was maintained at a high level throughout the period. At the same time a three-fold increase in malic enzyme (M.E.) and carboxylase activity was observed. It is suggested that these observations show that the climacteric rise in apple fruit attached to the tree is initiated by an increase in mitochondrial activity and develops through the joint action of increased activity of M.E. and carboxylase. The second paper describes the activities of various mitochondrial enzymes in the peel of apples picked before the climacteric peak in respiration (R) and throughout the development of the climacteric in storage at 12° C.; they showed an increase up to the climacteric peak and beyond. In pulp tissue the peak values for mitochondrial activity occurred several days before the peak value of R. The soluble enzyme M.E. reached a maximum in both peel and pulp at a point very close to the maximum value of R, while pyruvic carboxylase continued to rise past the climacteric peak. In fruit picked during the development of the climacteric on the tree and stored at 12° mitochondrial activity tended to follow changes in R; in the pulp a fall in the rate of mitochondrial activity probably began somewhat before R started to fall. M.E. activity increased rapidly on picking in the early stages of the climacteric, but little further increase occurred either in peel or pulp when fruit was picked near the point of maximum activity on the tree. This maximum activity on the tree was reached well before the peak in R, and corresponded in time with the maximum rate of R ever reached in detached fruit. It is concluded that an increase in activity of M.E. and carboxylase is largely responsible for the climacteric rise in R up to the maximum rate attained in detached fruit, and that the excess respiration above this value "on" the tree stems from other sources. [From authors' summaries. For earlier work see *H.A.*, 34: 4268.]—Ditton Lab., Larkfield, Kent.

7260. Deshpande, P. B.
Effects of physical maturation and storage on physical and biochemical changes in peach (*Prunus persica* S. and Z.) and apricot (*Prunus armeniaca* L.) fruits. *Diss. Abstr.*, 1964, **25**: 3508, being *Order No.* 64-13,731 of 110 pp.
See *H.A.*, 35: 2919.

7261. Romani, R. J., Breidenbach, R. W., and van Kooy, J. G.
Isolation, yield, and fatty acid composition of intracellular particles from ripening fruits. *Plant Physiol.*, 1965, **40**: 561-6, bibl. 16, illus.
A fuller account of work abstracted in *H.A.*, 35: 2845.

7262. Drawert, F., and others.
Enzymatische Veränderung des natürlichen Apfelaromas bei der Aufarbeitung. **(The enzymatic alteration of the natural aroma of apples during processing.)** *Naturwissenschaften*, 1965, **52**: 304-5.
Gas-chromatographic studies showed that the aromatic compounds given off by stored apples consist largely of esters, whereas those of the juice are composed mainly of alcohols. It is concluded that this difference is due to the hydrolysis of the esters during processing. [See also *H.A.*, 33: 452.]—Forsch.-Inst. Rebenzücht. Geilweilerhof.

7263. Volfová, A., Friedrich, A., and Chvojka, L.
Electron microscopy of ribosomes isolated from young green fruit of the apple tree. [Czech and Russian summaries 7 lines each.] *Biol. Plant., Prague*, 1965, **7**: 330-3, bibl. 17, illus.
The staining of the ribosome suspension with uranyl acetate indicated the probable distribution of RNA in polysomes. The morphology of the ribosomes is discussed.

Harvesting and handling.

7264. Mohsenin, N. N. (Editor).
Terms, definitions, and measurements related to mechanical harvesting of selected fruits and vegetables. *Progr. Rep. Pa agric. Exp. Stat.* **257**, 1965, pp. 17, bibl. 12, illus.
Names of plant parts (including apples, peaches, blueberries and *Phaseolus* beans); terms and factors relating to readiness for harvesting, harvesting injuries and physical, mechanical and rheological properties of produce; and determination of mechanical properties. [See also *H.A.*, 33: 2450, 4640 and 6596.]

7265. Cashmore, W. H.
The mechanical harvesting of fruit. *Fm Mechaniz.*, 1965, **17**(188): 39-40, bibl. 7, illus.
A brief survey of the present position.

7266. Markwardt, E. D., and others.
Research on mechanical apple harvesting. *Proc. N.Y. St. hort. Soc., 1965*, [1965], **110**: 128-31, illus.
The development and evaluation, over a 4-year period, is reported of several types of catching frame for the mechanical harvesting of apples for processing. The degree of bruising of the fruit was comparable to that of hand-picked fruit by the time it was delivered to the processors. [See also *H.A.*, 33: 6813 and 34: 2321 and 6409.]—Cornell Univ., Ithaca, N.Y.

7267. Folley, R. R. W.
A selective marketing policy for Worcester Pearmain. *Comm. Gr*, 1965, No. 3625, pp. 1384-5.
Costs and returns are compared for selective picking of apples and for picking the entire crop. Two types of selective picking were investigated, viz. harvesting the top 4 and the top 3 market packs only. With selective picking the net returns per acre were lower; costs were lower, however, and the average price returned was higher. A grower harvesting only the 4 best packs (the 2 sizes in each of the 2 top grades) could obtain a higher margin of profit per acre than if he had picked all the fruit, provided that his crop yield was 400–500 bushels/acre. With a yield of 300 bushels there would be a slight loss and with 500 bushels there would be no apparent change in margin.—Wye Coll., Ashford, Kent.

7268. Terschüren, H.-J.
Über den Einsatz von Apfelgrosskisten bei der Ernte. **(The use of bulk bins for harvesting apples.)** *ErwObstb.*, 1965, **7**: 43-5, bibl. 3, illus.
The use of bulk bins cuts down the harvesting time and on average is 25% cheaper than the use of small boxes.

7269. Holt, J. B., and Bull, D. A.
Use of an experimental self-loading vehicle for handling fruit. *J. agric. Engng Res.*, 1965, **10**: 36-43, bibl. 10, illus.
To enable the techniques of handling fruit in bulk bins with self-loading equipment to be studied, an experimental self-loading vehicle was constructed and used on 6 fruit farms of 20–800 acres. Results of the work show that the vehicle is capable of a high rate of loading and unloading when handling empty and laden bins, and that a high proportion of the total handling time is spent in travel. The methods used by the growers to move fruit at harvest time are reported, and the suitability of the self-loading vehicle for handling fruit is discussed. [Authors' summary.]—N.I.A.E., Silsoe, Beds.

7270. Morrison, W. W.
Market your fresh apples. *Mktg Bull. U.S. Dep. Agric.* **35**, 1964, pp. 20, bibl. 5, illus.
Recommendations on harvesting, packing (sheds, operation, equipment), cold storage, grades and inspection, and sale.

7271. Cunningham, A. C.
Operational efficiency in marketing fresh apples. *Diss. Abstr.*, 1964, **25**: 3299-300, being *Order No.* 64-13,798 of 99 pp.
See *H.A.*, 35: 496.

7272. Duggen, H.
Tauch-, Wasch- und Grosssortieranlage der Apfelzentrale Holstein. **(Dipping, washing and size-grading equipment at the Holstein apple co-operative centre.)** *ErwObstb.*, 1965, **7**: 94-6, illus.

7273. Ginsburg, L., Woods, G. S., and Louw, L. M.
Latest trend in packing and cold storage of apples and pears. *Dec. Fruit Gr*, 1965, **15**: 43-4, illus.
From trials of different types of polystyrene interleaf

tray for use in cartons, 2 were finally selected, which reduced bruising to 13% and 8%, respectively. The appearance and cushioning properties of the trays were excellent. No external chemical injury developed on apples held in close contact with the polystyrene at temperatures ranging from 50° to 90° F., and no internal physiological injury was visible to the eye. Apples in contact with the trays at 70° F. for 3 days, however, became tainted owing to the presence of a styrene monomer. Trays manufactured from polystyrene free from the styrene monomer did not cause tainting.—Fruit and Food Technol. Res. Inst., Stellenbosch.

7274. LaBelle, R. L.
Controlling cherry scald. *Proc. N.Y. St. hort. Soc., 1965*, [1965], **110**: 117-23, bibl. 7, illus.

In the 5 years since 1949 in which cherry scald occurred the July mean temperature was considerably higher than average and the number of days with temperatures exceeding 85° F. was nearly double the average. The amount of scald was shown to be determined by the extent of bruising, the prevailing temperature and the time elapsing between picking and packing. The prevention of bruising during harvesting and handling, and methods of cooling the fruit, are discussed.—N.Y. St. agric. Exp. Stat., Geneva.

7275. Hale, P. W., and Mallison, E. D.
Packing peaches at lower cost. *Agric. Mktg*, 1965, **10**(5): 10, illus.

Peaches packed in boxes received only one-third to one-half as many bruises and serious injuries as peaches packed in baskets with crown covers. [Authors' summary.]—U.S.D.A., Orlando, Fla, and Hyattsville, Md.

7276. Amaro, A. A.
Comercialização de figo na região de Valinhos. **(Fig marketing in the Valinhos region.)** *Agric. São Paulo*, 1964, **11**(6): 24-39, from *Trop. Abstr.*, 1965, **20**, Abstr. n1347.

Cultural practices, yields and costs of harvesting and packing in this principal fig-growing area of São Paulo State.

Storage.

(*See also* 7259, 7533.)

7277. Sebbel, H.
Grenzen und Möglichkeiten der zentralen Lagerung, Aufbereitung und Vermarktung. **(Limitations and possibilities of central storage, preparation and marketing [of fruit].)** *ErwObstb.*, 1965, **7**: 41-3, bibl. 3, illus.

7278. Mann, G.
Refrigerated fruit stores. *Agriculture, Lond.*, 1965, **72**: 304-7, illus.

Notes on insulation, gas-proofing, prefabrication and absorbents for CO_2.

7279. Ministry of Agriculture, London.
Atmosphere control in fruit stores. *S.T.L. Minist. Agric., Lond.*, **35**, 1964, pp. 7.

Gas-tightness, removal of excess CO_2, measuring the concentration of CO_2 and O_2, and operation of a CA store.

7280. Eaves, C. A., and Lockhart, C. L.
Canadians overcome store problem. *Grower*, 1965, **63**: 1197, illus.

Trials were carried out in 2 commercial apple stores on the use of an O_2-controlling device consisting of a propane burner and a dry lime scrubber [see *H.A.*, 34: 2336]. In the larger store, which held 6,000 bushels, McIntosh apples remained in good condition for 8 weeks at 3–5% O_2. The O_2 concentration was reduced to the desired level within 24 hours; temperatures within the stores were unaffected, although there appeared to be a slight increase in humidity.—Canada Dep. Agric., Kentville, N.S.

7281. Smock, R. M., and Blanpied, G. D.
The use of nitrogen for cooling, flushing, and maintaining atmospheres in CA rooms. *Proc. N.Y. St. hort. Soc., 1965*, [1965], **110**: 140-5.

Trials are described in which liquid N was introduced into a store containing Delicious and Golden Delicious apples in an atmosphere of 2% CO_2 and 3% O_2 at 32° F. The fruit cooled 2–3 times more rapidly in the presence of liquid N than it did with refrigeration alone.—Cornell Univ., Ithaca, N.Y.

7282. Tindale, G. B.
Apple and pear cool storage in Victoria. Part 5. Cool storage of other apple varieties. *J. Agric. Vict.*, 1965, **63**: 107-14, illus.

Delicious: This variety withstood long periods of storage at 32° F. The optimum picking date for long storage was 4 April, but picking from 20 March to 23 April was satisfactory. *Stewart's*: When harvest dates between 23 March and 12 May were compared, only those fruits picked on 28 April and 5 May were classed as excellent after storage until August. *Statesman*: Grown mainly for long storage, this variety can be stored at 32° F. without storage disorders developing. The best picking period was 14–18 April. *Rome Beauty*: This dual-purpose variety was best stored at 32° F. and picked between 14 and 28 April. *Yates*: Another long-storage variety, which should be picked after 28 April and kept at 32° F. [For part 4 on Granny Smith see *H.A.*, 35: 2884.]

7283. Hansen, H.
Über die Lagerung von Äpfeln und Birnen in Kunststoff-Folien. **(Storage of apples and pears in plastic film.)** *ErwObstb.*, 1965, **7**: 65-9, bibl. 9, illus.

Experiments showed that 50μ is the best thickness of polythene film for packing apples and pears. Of the apple varieties tested, only Golden Delicious could be stored in plastic bags with complete safety. The method was only of limited value for Berlepsch, Schweizer Glockenapfel and Jonathan, and resulted in a high percentage of storage disorders in Goldparmäne, Cox, Oldenburg and Boskoop. Williams', Conference and Louise Bonne pears could only be stored in polythene bags when the gas permeability of the film was increased by small perforations. Even with perforation results were not good with Alexandre Lucas, Köstliche aus Charneux and Clapp's Favourite. In general, the higher the storage temperature the greater were the losses, but the method brought considerable benefit even at 8° C. It is concluded that polythene is of little interest for commercial storage but should be of great value for household storage.—BundesforschAnst. LebensmittFrischhalt., Karlsruhe.

7284. Porritt, S. W.
Effect of cooling rate on storage life of pears. *Canad. J. Plant Sci.*, 1965, **45**: 90-7, bibl. 9.

Delays in placing the fruit of Bartlett pears in cold storage, or failure to cool the fruit rapidly once in cold storage, markedly increased its susceptibility to core breakdown, caused accelerated yellowing and increased the respiration rate of the fruit in cold storage. These adverse effects of unfavourable cooling procedures were not necessarily accompanied by accelerated softening. [From author's abstract.]—Canada Dep. Agric., Summerland, B.C.

7285. Cooper, W. J., and Padfield, C. S.
Storage rots of apples. *Orchard. N.Z.*, 1965, **38**: 135.

Fruit from different orchards was examined for fungal spores and infections in the orchard, in the packing shed and later in the cold store. Fifteen different species of fungi were identified; most of the rots were caused by *Gloeosporium*, *Glomerella*, *Penicillium*, *Alternaria* and *Pleospora* spp. Rotting was only a minor problem in fruit stored for about 100 days, but became serious when storage was extended to about 200 days. It appeared that the orchard itself was the major source of fungus spores. The percentage of rotted fruit in stored apples which had received a normal spray programme was 8·5 compared with 13 in unsprayed apples. Only ripe spot (*Gloeosporium* spp.) and bitter rot (*Glomerella* spp.) were adequately controlled by orchard sprays.

7286. Eckert, J. W., and Kolbezen, M. J.
2-Aminobutane salts for control of post-harvest decay of citrus, apple, pear, peach, and banana fruits. *Phytopathology*, 1964, **54**: 978-86, bibl. 20, illus.

Aqueous solutions of 2-aminobutane salts controlled *Penicillium digitatum* and *P. italicum* on citrus fruits, *P. expansum* on apples and pears, *Monilinia fructicola* on peaches and *Gloeosporium musarum* on bananas. The effectiveness of the 2-aminobutane treatment was enhanced by an increase in concentration from 0·25 to 1·0%, an increase in time of fruit contact from 2 sec. to 4 min., an increase in pH from 9 to 11 and an increase in temperature from 20 to 40° C. [From authors' abstract. For earlier work see *H.A.*, 32: 7293.]—Univ. Calif., Riverside.

7287. Pouwer, A., and Keuken, W.
Gewasonderzoek en het bewaaradvies. **(Plant analysis and advice on storage.)** *Fruitteelt*, 1965, **55**: 325-6, 356-8, illus.

Leaf samples of 4 apple varieties were analysed for K, Mg, Ca, N and P in order to predict the best time for harvesting the crop and the best storage conditions to prevent the occurrence of disorders such as Jonathan breakdown, bitter pit and scald. Other factors influencing the choice of storage conditions included fruit size, colour, ripeness and soundness, and the yield per tree. A table is given showed the relationship of the various factors to the presence or absence of storage disorders. —R.T.C., Arnhem.

7288. Bartram, R.
To minimize apple storage disorders, handle, store and harvest with care. *West. Fruit Gr*, 1965, **19**(3): 33.

Studies over 4 years are reported on the interrelationships between scald, water core and internal breakdown in Red Delicious apples harvested 135, 145, 155 and 165 days after full bloom. All the apples were stored at a fruit temperature of 31° F. and 85–88% R.H. The most serious scald appeared each season on the earliest harvested fruits. The percentage and severity of scald decreased as the delay in harvest increased up to 165 days after full bloom. Water core, on the other hand, increased in severity with an increase in the number of days from full bloom to harvest. The development of internal breakdown in the late storage period was in direct proportion to the severity and percentage of water core found immediately following harvest; breakdown increased in severity as the period of storage increased. The tests indicated that Red Delicious apples could be kept in excellent condition for 7 months if harvested 150 days or less after full bloom and treated with a scald inhibitor.—Agric. Ext. Serv., Wenatchee, Wash.

7289. Vukovits, G.
Ursachen der Stippigkeit und Möglichkeiten ihrer Bekämpfung. **(The causes of bitter pit and the possibilities of controlling it.)** *Pflanzenarzt*, 1965, **18**: 54-6, illus.

A brief survey.

7290. Clijsters, H.
Malic acid metabolism and initiation of the internal breakdown in "Jonathan" apples. *Physiol. Plant.*, 1965, **18**: 85-94, bibl. 14, illus.

The tissue of Jonathan apple fruits decarboxylated malic acid to acetaldehyde and ethanol. Malic acid decarboxylation occurred in both healthy apples and fruits affected by Jonathan internal breakdown. Breakdown-affected tissues produced acetaldehyde more readily than ethanol, but healthy tissues produced ethanol more readily than acetaldehyde. The production of acetaldehyde and ethanol by Jonathan tissues appeared to be one of the possible causes of the breakdown. [From author's summary.]—Res. Stat. Gorsem, Sint-Truiden, and Carnoy Inst., Univ. Louvain, Belgium.

Processing.

7291. Kriel, A. F.
Dehydration gives excellent prunes. *Fmg S. Afr.*, 1965, **41**(2): 40, 42, illus.

A hot-air drying plant is described and its advantages over sun-drying are discussed.

SMALL FRUITS, VINES AND NUTS.

Strawberries.

(*See also* 6926, 7254, 7256, 7257, 7540, 7581, 7582.)

7292. Branzanti, E. C.
La Fragola. Guida Pratica per la Coltivazione e la Commercializzazione della Fragola. **(The Strawberry. A Practical Guide to the Growing and Marketing of the Strawberry.)** Edizioni Agricole, Bologna, 1964, 8½×5½ in., pp. 181, illus., L. it. 1,600.

The remarkable increase in the production, export and consumption of strawberries in Italy during the past decade has raised problems of cultural practices and marketing that are surveyed in this book in the light of experience gained in the laboratory and the field and from the study of strawberry growing, harvesting and marketing in other countries, notably Holland and the U.S.A. The chapters are arranged in the following order: The importance of the crop; The strawberry plant; Propagation; The choice of environment and soil;

Soil preparation and planting; Planting systems and spacing; Planting time; Planting; Manuring; Soil cultivation and cropping systems; Defoliation; Mulching; The duration of a strawberry bed; Summer and autumn production; Forcing; Harvesting and packing; Quality requirements for strawberries; The principal diseases and pests; Planting and production costs per ha. for Madame Moutot strawberries in the plain of Imola; Varieties; Descriptions of some typical varieties; Descriptions of some ever-bearing varieties. The book is indexed and well illustrated. An erratum slip gives 13 corrigenda for figures in the tables of production and trade, but apart from this the standard of production is excellent. K.C.

7293. Kobel, F.
Der Anbau von Erdbeeren in der deutschen Schweiz. **(Strawberry growing in German-speaking Switzerland.)** *Schweiz. Z. Obst- u. Weinb.*, 1965, **101**: 370-5, illus.

Varieties, packaging and marketing, production of virus-free planting material and cultural practices (including growing under fruit trees).

7294. Bruijstens, J. M.
Knelpunten bij de teelt van aardbeien. **(Key points in strawberry growing.)** *Groent. en Fruit*, 1965, **20**: 1939, 1941.

The points discussed are varieties, time of planting (yields in 1964 from planting in April and August, 1963, were 274 and 140 kg./are), method of planting (machine planting cheaper than hand planting), plastic mulching and chemical weed control.

7295. Zambrowicz, E.
Cultura căpşunilor remontanţi. **(Growing everbearing strawberries.)** *Grăd. Via Liv.*, 1965, **14**(4): 56-9, illus.

Culture in Romania, plant protection, varieties and yields.

7296. Brown, T., and Wareing, P. F.
The genetical control of the everbearing habit and three other characters in varieties of *Fragaria vesca*. *Euphytica*, 1965, **14**: 97-112, bibl. 17, illus.

Three diploid varieties were studied, namely, the wild type and the cultivated Alpine varieties Baron Solemacher and Bush White. The characters studied in addition to the everbearing habit were runnering habit, branching habit and fruit colour.—Univ. Manchester.

7297. Courter, J. W., and Zych, C. C.
Everbearing strawberries for Illinois home gardens. *Ill. Res.*, 1963, **5**(1): 17.

Brief notes on the 5 best varieties out of 13 evaluated.

7298. Darrow, G. M., Scott, D. H., and Waldo, G. F.
Strawberry varieties in the United States. *Fmrs' Bull. U.S. Dep. Agric.* **1043**, revised 1964, pp. 19, illus.

Recommendations on varieties for northern and southern states, for home gardens and for commercial growing (suitable for shipping, preserving, freezing) followed by descriptions and characteristics of 35 varieties.

7299. Säkö, J.
Om några nordamerikanska jordgubbsorters odlingsduglighet i Finland. **(The performance of some Northern American strawberry varieties in Finland.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, p. 253.

Pocahontas was the best of a number of American varieties tested in Finland; it showed some resistance to grey mould and appeared to be suitable for processing. Guardsman and Redcoat were best among the Canadian varieties tested.

7300. Craig, D. L., and Aalders, L. E.
Acadia strawberry. *Canad. J. Plant Sci.*, 1965, **45**: 298.

This hybrid between Redcrop and Sparkle, introduced by Kentville Research Station, N.S., has many of the desirable characteristics of the variety Sparkle but maintains a larger fruit size throughout the season. It matures 2 or 3 days earlier than Sparkle, and is suitable for both the fresh fruit trade and the freezing industry.

7301. Harris, R. E.
Protem strawberry. *Canad. J. Plant Sci.*, 1965, **45**: 299.

This hybrid of Glenheart and Cheyenne 2, developed at Beaverlodge Research Station, Alberta, produces larger fruit and is hardier than Senator Dunlap, for which it is a suitable replacement for garden use.

7302. Lazareva, A. G.
Strawberry selection under conditions of the North Caucasus. [Russian, with English summary 7 lines.] *Tr. priklad. Bot. Genet. Selekc.*, 1964. **36**(3): 158-70, illus.

Detailed descriptions of 7 new varieties.

7303. Mihăescu, G., Prodan, G., and Mănescu, C.
Studiul unor soiuri de căpşuni în condiţii de silvo-stepă. **(Studies on some strawberry varieties grown under forest-steppe conditions.)** [French and Russian summaries ½ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 87-95, bibl. 5.

To reduce reliance on the one variety, Madame Moutot, in the important strawberry growing area around Bucharest, the behaviour of 15 varieties was studied. The best results were obtained with Joseph Mahomet, Kaisers Sämling, Sachsen, Laxton's Noble, Deutsch Evern, Jubiläum, Sieger, Müncheberger Frühe and Louise. Average yields over 3 years ranged between 7,020 and 13,035 kg./ha. Picking continued over 38–42 days. Sachsen, Roter Elephant, Louise and Jubiläum proved more suitable for fresh consumption than for processing.

7304. Lockhart, C. L.
Losses of cold-stored strawberry plants due to mold, and factors affecting the survival of new plantings in the field—1964. *Canad. Plant Dis. Survey*, 1965, **45**: 11-12

Losses of strawberry runners in commercial cold stores ranged up to 6%, and were ascribed in one case to a delay in cooling and in another case to low O_2 and high CO_2 levels due to the polyliners in the storage crates being wrapped too tightly. Losses in new plantings from cold-stored runners averaged 20·5%, of which green petal was a main cause and mouldy plants (1·6%) a minor one. Losses in new plantings of non-stored runners were only 10%.—Canada Agric. Res. Stat., Kentville, N.S.

7305. OP'T HOOG, G. T.
Voorjaarsplanting van aardbeien. **(Spring planting of strawberries.)** *Groent. en Fruit*, 1965, **20**: 1603, illus.

At Boekel 3 dates of planting were compared for Senga Sengana, viz. July for cold-stored runners and August and April for untreated runners. Spring planting gave by far the highest yields. More runners per mother plant were available in April than in August, planting could be carried out over a longer period and subsequent rooting and growth were more rapid in spring than in summer.—R.T.C., 's-Hertogenbosch.

7306. BLOMMERS, J.
Aardbeien onder glas. **(Strawberries under glass.)** *Groent. en Fruit*, 1965, **20**: 1715.

Costs are compared for 4 methods of forcing, viz. (a) unheated glass; (b) warm-air heating after mid-February; (c) central heating after the beginning of February; (d) central heating and supplementary illumination after the beginning of January. The economics of the methods are discussed in relation to the time at which the houses are free for planting summer or autumn crops of tomatoes.—R.T.C., Geldermalsen.

7307. HUGHES, H. M.
Making and using polythene tunnels for crop protection. *Comm. Gr*, 1965, No. 3618, pp. 1061-2, illus.
Polythene plus glass makes strawberries "steam ahead". *Grower*, 1965, **63**: 1016-17, illus.

A sheet of 150-gauge clear polythene, 40–42 in. wide, is unrolled and secured over wire support hoops inserted not more than 4 ft. apart over strawberry rows; the ends are tied down to stakes. Access to plants is simple for spraying, hoeing and picking. The estimated cost is about £1 for a 100-ft. run of tunnel. When a sheet of flat polythene was placed over a single row of strawberries in late February and anchored by glass cloches, growth was very rapid; soil temperatures at a depth of 4 in. were 6–7° F. above those in bare soil; and polythene was finally removed in early April.—Efford exp. Hort. Stat.

7308. CREASY, L. L., MAXIE, E. C., AND CHICHESTER, C. O.
Anthocyanin production in strawberry leaf disks. *Phytochemistry*, 1965, **4**: 517-21, bibl. 19.

Leaf discs of *Fragaria vesca* var. Alpine floated on sucrose solutions produced anthocyanin at a constant reproducible rate for several days. Light was necessary to initiate anthocyanin production and stimulated its continued synthesis, which was maximal at 25–30° C. and, with illuminated discs, at a sucrose concentration of 0·1 M. Much higher sucrose concentrations were required for maximum production in the dark. Dinitrophenol was an effective inhibitor of anthocyanin production at $7{\cdot}5\times10^{-5}$ M in both light and darkness; NaF was inhibitory at 0·02 M, but only in darkness. ATP stimulated production in the light only when sucrose was not supplied, but in the dark only when combined with sucrose; it was not effective if supplied at the beginning of the induction stage. [Authors' abstract.]—Univ. Calif., Davis.

7309. ARNEY, S. E., AND OVENDEN, E. A. G.
The mechanism of the stimulation of growth of strawberry plants by gibberellic acid. *Phyton, Argentina*, 1965, **22**: 93-101, bibl. 15.

GA sprayed on the leaves of strawberry plants produces enlargement of leaf laminae and elongation of both internodes and petioles, but these effects are not simultaneously manifested, and the elongation of the internodes is not apparent until after the maximum increase in leaf size has given way to a dwarfing effect. Very dwarfed leaves and petioles are produced at the time when internode elongation is at its maximum. The histological effect of GA is to increase cell division, even in leaves which have reached the vacuolation stage at the time of application oI GA. The small effect of GA on cell size is confined to the epidermis and to the small cells at the distal end of the petiole; in the leaf lamina GA may reduce epidermal cell size rather than increase it, but the differences are too small to be statistically significant. Generalized conclusions about the action of GA on vacuolation based on measurements in a single tissue, particularly the epidermis, are shown to be misleading, and the idea that GA acts mainly on the vacuolation phase of growth must be abandoned. [Authors' abstract.]—Univ. Coll., Cardiff.

7310. JONKERS, H.
On the flower formation, the dormancy and the early forcing of strawberries. [Dutch summary 2 pp.] *Thesis LandbHogesch. Wageningen*, reprinted as *Meded. LandbHogesch. Wageningen*, 1965, **65**(6): 1-59, bibl. 186, illus.

The effects and interactions of day length, temperature and growth substances on strawberries were investigated in order to determine whether successful forcing could be carried out before 15 January (the earliest date in commercial practice). The variety Deutsch Evern was used in most of the trials, although other octoploid varieties and 2 diploid varieties of *Fragaria vesca* were also investigated. It was shown that flower initiation in early varieties took place before that in late varieties; there was little difference in the time of initiation between early and mid-season varieties. For Deutsch Evern, once a minimum leaf area had been produced, 14–18 short-day (SD) cycles (8 hours light+16 hours dark) at 18° C. were necessary for flower initiation. Flower formation was influenced more by day length than by temperature. Plants remained entirely vegetative if the natural SD were extended by incandescent light; at 21° a minimum of 2,400 erg/cm.²/sec. (= 400 lux) at plant height was necessary to maintain vegetative growth. Fluorescent lighting proved ineffective. At 5° the plants were almost day-neutral, but flower initiation could be hastened by 16 or 24 hours of incandescent lighting per day. Following prolonged periods at 5° generative plants reverted to a vegetative condition. No vernalization effect was observed when chitted seeds of diploid and octoploid varieties were treated at 3–5° for periods of up to 10 weeks. For the diploids the time from treatment to flower bud formation was much shorter in LD than in SD, whereas for octoploids flowers developed only during SD and then very slowly. Flowering was not inhibited by GA_3 application (3 sprays at 15 p.p.m.) before or during SD treatment for 4 weeks; applications after SD treatment resulted in earlier flowering, more open flowers and longer trusses. Pairs of young Deutsch Evern plants, connected by a runner, received differential day-length treatments, viz. the "mother" and/or the "daughter" plants were grown for 3 weeks in SD or LD at 20°. Almost all plants in SD formed flower buds, whereas only 2 out of 6 "daughter" plants connected with a "mother" plant receiving LD did so. This would appear to support Guttridge's theory [see *H.A.*, 30: 312] that an inhibitor rather than a promoter of flowering is involved. A reduction in day length encouraged dormancy to a greater extent than low temperatures. An extension of the natural day length in September to 16 hours by incandescent lighting resulted in a continuation of top growth at 15–21°, but root growth was reduced. Fluorescent lighting was ineffective. Complete dormancy was not observed in any variety; for Deutsch Evern the elongation of the petioles and fruit trusses in plants receiving forcing treatment was at a minimum between 15 October and 15 November. Fruit truss elongation in autumn was stimulated by short periods of cold supplemented by LD and sprays of GA_3. Earliness, however, was not associated with any degree of dormancy or of truss elongation. Spraying with GA_3, although it increased the number and length of trusses, reduced the size of fruit and delayed fruiting. Success in forcing plants before 15 January depended mainly upon the variety (each appeared to have a particular chilling requirement) and upon light intensity and temperature. The later forcing was started the heavier was the yield obtained. [See also *H.A.*, 33: 2513.]

7311. Quagliotti, L.
Argomenti di biologia fiorale e carpica in *Fragaria* sp. (**Observations on flower and fruit biology in *Fragaria* spp.**) *Riv. Ortoflorofruttic. ital.*, 1965, **49**: 186-93, bibl. 25, illus.

A review, with emphasis on problems of sterility.

7312. McFadden, W. H., and others.
Volatiles from strawberries. II. Combined mass spectrometry and gas chromatography on complex mixtures. *J. Chromatog.*, 1965, **18**: 10-19, bibl. 24.

By a combination of these methods of analysis [see also *H.A.*, 34: 199] over 150 components were isolated from a complex oil of strawberry volatiles. Most of the major components were identified. They included alcohols, esters, acetals, aldehydes, furfurals, aromatic aldehydes, ketones, terpenes and aromatic hydrocarbons.—W. reg. Res. Lab., Albany, Calif.

7313. Fregoni, M., and Zioni, E.
Ricerche sulla concimazione fogliare della fragola. (**Studies on the foliar nutrition of strawberries.**) *Ann. Fac. Agr. Univ. cattol. S. Cuore, Milano*, 1964, **4**: 480-8, bibl. 16.

Experimental data on Fito-Feed, a new formulation containing tryptophan.

7314. Svjatskaja, L. N.
The microflora of strawberry roots and their importance in the nutrition of the plants. [Russian.] *Agrobiologija*, 1965, No. 1, pp. 37-9.

In studies on the microflora of strawberry roots during the first 3 years of the plant's life the number of bacteria was found to increase to a maximum in the second year. Treating the roots of potted strawberry plants with a suspension of *Pseudomonas denitrificans* did not affect leaf growth but considerably increased root growth compared with that of the untreated controls. In a field trial both root growth and leaf growth were increased by treatment with the suspension.

7315. Overcash, J. P., and Crockett, S. P.
Soil fumigation increases strawberry yields. *Miss. Fm Res.*, 1965, **28**(2): 1-3, illus.

In a comparison of 4 pre-planting soil fumigation treatments, allyl alcohol at ⅞ pint, Mylone (85W) at ½ lb. and Vapam (32·7%) at 1½ pints per 49 sq. ft. gave good control of weeds, encouraged runner production and increased yields. Treatment with Nemagon (10% granules) at ½ lb. per 49 sq. ft. had no obvious beneficial effects. In a second trial on the effects of Mylone 50D on 4 strawberry varieties, a rate of 0·85 lb./100 sq. ft. applied in the autumn gave effective weed control throughout the following spring. Runner production and plant survival were better on the Mylone-treated plots. The largest increase in yield was shown by the variety Earlidawn on treated plots. The variety Pocahontas gave the highest overall yields, about twice those of Earlidawn, but the average yield of Earlidawn over 3 years from treated plots was about two-thirds that of Pocahontas on treated plots. Treatment delayed fruit ripening.

7316. Walls, I. G.
Polythene mulching of strawberries. *Scot. Agric.*, 1965, **44**: 199-200, illus.

The advantages and technique of using black polythene.

7317. Porter, L. A.
Polythene sheet mulching can cause restriction of strawberry roots. *N.Z. J. Agric.*, 1965, **110**: 253-5, illus.

The restriction of root growth on the secondary crowns by a polythene mulch can be avoided by cutting the sheeting clear of the secondary crowns as soon as the foliage has developed well enough to suppress the weeds beneath it.—Levin hort. Res. Centre.

7318. Bailey, F. L.
New methods and varieties improve strawberry yields in Auckland. *N.Z. J. Agric.*, 1965, **110**: 339-44, illus.

The methods outlined include the use of polythene sheeting a as mulch and chemical weed control. Cambridge Favourite and Redgauntlet have superseded Captain Cook.

7319. Kramer, S.
Bodenbearbeitung und Unkrautbekämpfung bei Erdbeeren. (**Soil cultivation and weed control in strawberry crops.**) *Obstbau, Berlin*, 1965, **5**: 101-3, bibl. 10, illus.

The treatments in trials with 3 varieties on heavy soil in 1961-64 were: (1) no cultivation, W6658 herbicide [composition not stated] treatment in spring and autumn; (2) repeated cultivation, no herbicide; (3) herbicidal treatment in spring (20 April) with thorough cultivation in the latter half of the year; (4) thorough cultivation in spring, herbicidal treatment in late summer (25 August). *Stellaria media*, *Poa annua*, *Agropyron repens* and *Urtica urens* were among the common weeds. The rate of application of W6658 was 2 kg./600 l./ha. Yield and quality grading data are presented. For example, the yields per plot in one trial in 1964 were 2·304, 2·791, 2·377 and 2·686 kg., respectively, with the 4 treatments. It was concluded that, at the rate tested, W6658 has no adverse effect on strawberry yield or quality and is suitable for use on heavy soils in late August or early September. High yields are only obtainable on heavy soils with adequate cultivation, and the exclusive use of herbicides is not practicable. Senga Sengana was more resistant to W6658 than Mieze Schindler and Brandenburg.—Inst. Acker- u. PflB., Univ. Jena.

7320. Horowitz, M., and Cohen, S.
Experiments on weed control in strawberries, Neve-Ya'ar 1962-63. [Hebrew, with English summary.] *Prelim. Rep. nat. and Univ. Inst. Agric., Rehovot*, **455**, 1964, pp. 14, bibl. 16.

In tests with several herbicides the best weed control was obtained with simazine granular at 0·5 kg./ha. applied 5 days before planting, and with chloroxuron w.p. at 1·25 and 2·5 kg./ha. or simazine w.p. at 0·5 kg./ha. applied 12 days after planting. The highest strawberry yield throughout the harvest period was obtained with chloroxuron at 1·25 kg./ha.—Agric. Exp. Stat., Neve-Ya'ar, Israel.—From *Weed Abstr.*, **14**: No. 94.

7321. Attenburrow, D. C.
Soil-applied herbicides in strawberries. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 4.

On the basis of experience obtained in trials at Molo, the following herbicides are tentatively recommended for pre-planting application in strawberries: C 2059 [*N*-(3-trifluoromethylphenyl)-*N′N′*-dimethylurea] at 2 lb./acre, monuron at 6 lb./acre (not less than 10 days before planting), diuron at 1 lb./acre (injury was, however, observed when heavy rain followed treatment with 12·8 oz./acre), neburon at 2–4 lb./acre, dichlobenil at 7–10 lb./acre, WL 5792 [2,6-dichlorothiobenzamide] at 2 lb./acre and simazine at 2 lb./acre. In addition, dichlobenil at 7 lb./acre, neburon at 3 lb./acre, diuron at 1 lb./acre and monuron at 4–8 lb./acre may be used in established strawberries, provided the crop is protected from spray wetting. The trend towards continuous cropping for periods of 12–18 months reduces the risk of perennial weeds becoming established, and increases the effectiveness of a mulch.—Hort. Res. Stat., Molo, Kenya.—*Weed Abstr.*, **14**, No. 92.

7322. Childs, W. H.
Chemical weed control for strawberries in West Virginia. *Current Rep. W. Va agric. Exp. Stat.* **40**, 1964, pp. 11, illus.

On plots cleared of weeds EPTC at 5 lb. a.i./acre plus simazine at 1·5 lb. a.i./acre, applied about 5 weeks after planting Catskill strawberries in the spring, satisfactorily suppressed subsequent weed growth without causing crop injury. The variety Surecrop was slightly injured by the mixture but soon recovered, whereas Pocahontas was more severely damaged.

7323. Zavarzin, V. I., Šihmatova, R. I., and Beljaeva, T. V.
Herbicides in strawberry plantings. [Russian.] *Sadovodstvo*, 1965, No. 5, pp. 24-5.

In 2 years' trials neburon at 8 kg., sesone at 10 kg. and Falone at 10 kg./ha. gave the most effective weed control and resulted in the best yield of strawberries. Simazine, at dosages higher than 4 kg./ha., and monuron were both phytotoxic to the strawberries.

7324. Johnson, C. F., Maxie, E. C., and Elbert, E. M.
Physical and sensory tests on fresh strawberries subjected to gamma radiation. *Food Technol.*, 1965, **19**(3): 119-23, bibl. 16.

Fresh strawberries were subjected to pasteurization levels of gamma radiation applied in conjunction with accepted commercial procedures of temperature and handling. The fruit was evaluated for texture, flavour, aroma and general appearance. Objective measurements showed that the berries became progressively softer as the dose increased from 100 to 400 kr. The strawberries became more resistant to crushing with storage periods of 10 days. This toughening effect was not prevented by reducing water losses by storing the fruit in vented polythene bags. The sensory evaluation of Shasta and Lassen strawberries irradiated at 0, 100, 200 and 300 kr. revealed only small differences in flavour. Differences in appearance, aroma and texture were greater, though irradiation had no objectionable effect on these characters. Berries irradiated at 200 kr. seemed to have slightly less lustre than control fruit. [From authors' summary.]—Univ. Calif., Davis.

7325. Staden, O. L., and van Laar, J.
Bestraling von aardbeien. (**Irradiation of strawberries.**) *Fruitteelt*, 1965, **55**: 790-1, illus.

Fruits of Senga Sengana, Talisman and Cambridge [unspecified] were irradiated with fast electrons of 3 MeV energy at dosages of 75 and 225 krad. before storage at 10° C. Cambridge was the variety most susceptible to fungus rots, and Talisman was the least susceptible. There were also varietal differences in the response to irradiation. Irradiation at 75 krad. made it possible for the fruit to remain 2 days longer in storage.—Inst. Bewar. Verwerk. TuinbProd., Wageningen.

7326. Smith, W. L., Jr., and Worthington, J. T., III
Reduction of postharvest decay of strawberries with chemical and heat treatments. *Plant Dis. Reptr*, 1965, **49**: 619-23, bibl. 15.

Exposure of strawberries to hot air at 110° F. for ½ hour at 98% R.H. or for 1 hour at 90% R.H., or dipping the berries for 15 seconds in a 0·5% solution of the sodium salt of dehydroacetic acid (DHA-S), effectively reduced post-harvest decay (*Botrytis* and *Rhizopus* spp.) during 4 subsequent days at 60°. Exposure of berries to hot air at 110° and 50%, 60% or 70% R.H. did not reduce decay. Dipping the berries in a 1% solution of DHA-S reduced decay but caused severe injury. Dipping for 15 seconds in water at 110° injured the berries and only slightly reduced decay. Pre-harvest sprays of thiram or 2,6-dichloro-4-nitroaniline (Botran) did not reduce post-harvest decay. [From authors' abstract.]—U.S.D.A., Beltsville, Md.

7327. Paltrinieri, G.
Lotta antibotritica postraccolta della fragola. (**Post-harvest treatments against grey mould of strawberries.**) *Inf. fitopat.*, 1965, **15**: 119-21, illus.

With the strawberry variety Madame Moutot post-harvest treatment with 0·3% captan or 0·25% TMTD very significantly checked the development of *Botrytis cinerea* on the fruit. Among the other fungicides used the effectiveness decreased in the following order: Alisan (chloronitroaniline), griseofulvin, Tamid (N-acetyl-N_4-phthalylsulphamide), vitamin K, penicillin G and Albotene P 80 (an organic B compound). This last product had previously shown high promise against strawberry grey mould. Weight loss was least with Albotene P 80 and next lowest with Alisan. Selection of healthy fruits at harvesting was much more effective than the use of any of the above products in checking grey mould development during marketing.

Other small fruits.

(*See also* 6926, 7145, 7176, 7254, 7257, 7537, 7568, 7578, 7622.)

7328. Ministry of Agriculture, London.
Bush fruits. *Bull. Minist. Agric., Lond.*, **4**, 8th Edition, 1965, pp. 70, illus., 8s. 6d.

In this latest edition of the bulletin, dealing with black currants, gooseberries and red currants, the recommendations on cultural practices have been brought up to date, especially with regard to varieties, irrigation and weed control. Economic aspects of growing the crops are also considered. [For the previous edition see *H.A.*, 29: 2188.]

7329. Rousi, A.
Utnyttjandet av vilda bärväxter i förädlingsarbetet. **(The use of wild berried fruits in breeding work.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, p. 252.

Brief notes on work in progress in Finland on crossing *Rubus arcticus* with *R. idaeus*, on breeding *Vaccinium corymbosum* and *V. australe* for winter hardiness and on a collection of sea buckthorn (*Hippophaë rhamnoides*) from Europe and Asia.

7330. Vitkovskij, V. L.
Small fruit breeding under conditions of the Far North. [Russian, with English summary 5 lines.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 149-57, illus.

Currants and raspberries.

7331. Groven, I.
Forsøgsarbejdet med bærfrugt i Danmark. **(Research work on small fruits in Denmark.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 247-9.

Variety trials on raspberries, black currants, red currants and elderberries are summarized. Other work noted includes the search for indicator plants for black currant viruses, and manurial trials.

7332. Ministry of Agriculture, London.
Chemical weed control in bush and cane fruits. *S.T.L. Minist. Agric., Lond.*, **14**, revised 1964, pp. 9.

In black currants, raspberries, gooseberries, loganberries and blackberries, including weed control on unplanted land and in cutting beds, cane nurseries and fruiting plantations.

7333. Littler, A. E.
Blackberry culture in British Columbia. *Publ. B.C. Dep. Agric. hort. Branch* **65-10**, 1965, pp. 5, illus.

7334. Kattan, A. A., and others.
Quality of machine-harvested blackberries. *Arkans. Fm Res.*, 1965, **14**(2): 13.

A table is given showing the results obtained in an experiment comparing hand harvesting with the use of a vibrator [see *H.A.*, 35: 2965]. This indicates that the quality of the machine-harvested crop was distinctly superior to that of the crop picked by hand. With machine harvesting the best results were obtained with an interval of 6 days between pickings.

7335. New Jersey Agricultural Experiment Station.
Proceedings of the 32nd Annual Blueberry Open House, Hammonton, N.J., 1964, pp. 28.

Papers read at this meeting deal with the following subjects: The development of a new pint-sized consumer package; weed control; Mg nutrition; breeding; frost protection; and a new experimental automatic blueberry harvester. Papers on pest control and pollination have been abstracted separately.

7336. Whitton, L.
The cytotaxonomic status of *Vaccinium angustifolium* Aiton in commercial blueberry fields of Maine. *Diss. Abstr.*, 1964, **25**: 3183, being *Order No.* 64-13,792 of 158 pp.

7337. Moore, J. N.
Improving highbush blueberries by breeding and selection. *Euphytica*, 1965, **14**: 39-48, bibl. 19, illus.

A review of the development of the highbush blueberry in the U.S.A. since the first hybridizations in 1911 is followed by notes on techniques of breeding and selection, the present breeding objectives, the value of interspecific hybridization in blueberry breeding (desirable characters in 18 diploid, tetraploid and hexaploid species are listed) and the inheritance of characters in the blueberry.—U.S.D.A., Beltsville, Md.

7338. Worthington, J. T., and Scott, D. H.
Cold storage effects on rooting of blueberry cuttings. *Amer. Nurserym.*, 1965, **121**(12): 12, 28.

Cuttings taken from the current year's growth of Rancocas [highbush] blueberry plants were stored with or without moist peat in polythene bags at different temperatures. After 5 months' storage the top growth and callus formation were greatest on cuttings stored at 50° F. in peat, but a high percentage of the cuttings had not formed roots. Top growth was slight in cuttings stored with peat at 40°, without peat at 50°, and with or without peat at 30° for 3 months followed by 40° for 2 months. Low temperature injury was evident in 30% of the cuttings stored at −10° with peat. The percentage rooting was high and root growth was good in cuttings stored at 24°, 30° and 40° or at alternating temperatures of 30° and 40°. Cuttings stored at 24° with peat rooted better than those without peat. On the basis of the rooting results and costs of refrigeration, storage at 30° without peat was the best treatment. —U.S.D.A., Beltsville, Md.

7339. Trevett, M. F.
Fertilizing lowbush blueberries is tricky. *Me Fm Res.*, 1965, **12**(4): 35-42, bibl. 1.

A new method of fertilizing blueberries, namely applying N compounds at dieback when the stems have ceased elongating, is recommended for trial. Applying fertilizer at this stage does not increase stem length but it does raise the number of fruit-buds per inch of stem and encourage branching.

7340. Trevett, M. F.
More about fertilizing lowbush blueberries. *Me Fm Res.*, 1965, **13**(1): 9-12.

Fertilizer practice in the burn year is discussed, and data on the effects of pre-emergence applications of N fertilizer, obtained from 23 tests over 9 years, are summarized. [See also *H.A.*, 33: 4710.]

7341. Filmer, R. S., and Marucci, P. E.
Honeybees and blueberry pollination. *Proc. 32nd annu. Blueberry Open House, Hammonton, N.J., 1964*, pp. 25-7.

Cage tests on the Weymouth variety showed that a much higher degree of fruit set was achieved with the intensely high population of bees in cages than in the open field, despite a heavy concentration of bees there. Cross-pollination did not induce a higher percentage of fruit set, but the resulting berries matured more rapidly. Fruits on plants in the open field were larger than those in cages, owing to the better conditions for cross-pollination and also to the poorer set under field conditions. In studies on the relative attractiveness of different varieties to honeybees, an almost direct relationship was found between the attractiveness of a variety and its known productiveness. [For earlier work see *H.A.*, 34: 2392.]—Rutgers Univ.

7342. Matzner, F.
Über den Vitamin-C-Gehalt der Kulturheidelbeeren. **(The vitamin C content of blueberries.)** *ErwObstb.*, 1965, **7**: 105-8, bibl. 10.

In an investigation on 7 American varieties of highbush blueberry in 1962 and 1964 it was found that the vitamin C content depended on variety. The fresh-weight range was from 12 mg. per 100 g. in Jersey to 21 mg. in Rancocas. The dry-weight range was from 98 mg. per 100 g. in Jersey to 148 mg. in Blueray. The vitamin C content was high with a low 100-berry weight, and vice versa. It was reduced by shade; for example, in the Berkeley variety it was 115·5 mg. per 100 g. dry weight in fruit growing in the sun and 107·3 mg. in shaded fruit. Storage at −20° C. for 100 days reduced the vitamin C content considerably in each of 3 varieties studied; the fall ranged from 25% in Coville to 60% in Rancocas.—Inst. Obstb., Weihenstephan.

7343. Legros, N.
Groseilles et cassis. **(Red and black currants.)** *Fruit belge*, 1965, **33**: 100-5.

Culture, varieties and economics in Belgium.

7344. Bočkarnikova, N. M.
***Ribes dikuscha* Fisch., a valuable black currant species of the Far East.** [Russian, with English summary 6 lines.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 25-39, bibl. 7, illus.

A long-term study of *R. dikuscha* under natural and cultivated conditions is reported. The species is of particular interest for breeding purposes, as it is highly frost resistant, early ripening, a heavy cropper and disease resistant. Four promising seedlings have been selected.

7345. Garay, A., Szilvay, M. G., and Sági, F.
A légzés károsodása és a mutabilitás kapcsolata. **(The relationship between a disturbance to respiration and mutability.)** [English and Russian summaries ¼ p. each.] *Kísérl. Közlem., Sect. C*, 1964 (issued 1965), **57C**(2): 3-13, bibl. 27.

The black currant variety Juharlevelű, which produces a high rate of bud mutants, had a higher content of nucleotide triphosphates and a higher respiration rate than the stable control varieties. Owing to some disturbance, the triphosphates were not utilized for DNA synthesis, whereas the RNA content remained unchanged and the intensive respiration increased the RNA : DNA ratio.

7346. Kronenberg, H. G., and Hofman, K.
Research on some characters in black currant progenies. *Euphytica*, 1965, **14**: 23-35, bibl. 9, illus.

Populations derived from selfs and crosses of a small number of black currant varieties with the variety Consort were analysed for vigour, number of flowers, flowering time, ripening time, fruit-set, strig length and berry size. [From authors' abstract.]—Inst. hort. Plant Breed., Wageningen.

7347. Ljones, B.
Nordisk sortsliste for solbær. **(A Scandinavian list of black currant varieties.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, p. 251.

Ten varieties are listed, together with the regions for which they are recommended.

7348. Dhillon, B. S.
Growth of black currant stem cuttings rooted under different photoperiods. *Indian J. Hort.*, 1964, **21**: 201-3, bibl. 2.

Black currant cuttings were rooted under short-day (8-hour) or long-day (17-hour) conditions; half the plants in each treatment were then grown on under the original photoperiod and half were transferred to the other photoperiod. Mean extension growth was 40·1, 27·5, 2·1 and 0·5 cm. with the SD-LD, LD-LD, LD-SD and SD-SD treatments, respectively. The corresponding leaf numbers were 32·6, 17·75, 4·4 and 2·8. It was concluded that day length subsequent to rooting was more important than that during rooting. [See also *H.A.*, 34: 493 and 35: 592.]—Univ. Reading.

7349. Hårdh, J. E., and Wallden, J.
Mustaherukan kukankehitys ja marjanmuodostus. **(Flower formation and fruit growth in black currants.)** [English summary ⅓ p.] *Maataloust. Aikakausk.*, 1965, **37**: 61-75, bibl. 21, illus.

Data on flower bud differentiation are tabulated for 5 varieties of black currant at different localities in Finland. These indicated that differentiation was delayed by long days and was favoured by a day length of less than 13 hours. They also showed that the Finnish varieties were better adapted to long-day conditions than were the imported British varieties. Differentiation continued during the winter until the 5th developmental stage. In pollination tests Lepaan musta was completely self-fertile and Brödtorp partially self-fertile. Wellington XXX was a better pollinator for Brödtorp than was Lepaan musta and *vice versa.* A close correlation was shown to exist between the size of the berry and the number of seeds.—Univ. Helsinki.

7350. Larsen, F.
Undersøgelser over solbærplanters vækst og kvælstofoptagelse. **(Studies on the growth and nitrogen uptake of black currant plants.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 249-51.

A shorter version of work abstracted in *H.A.*, 34: 4400.

7351. Porter, L. A.
Weed control in blackcurrants and raspberries by a combination of weedicides and mown sward. *Proc. 16th N.Z. Weed Control Conf., 1963*, pp. 33-7, bibl. 1.

Black currants and raspberries were planted in a hedgerow system and an established grass/clover sward was maintained between the rows. Diquat at 1 lb./acre and paraquat at 0·5 lb./acre in 200–300 gal. water, applied as directed sprays under dormant bushes, eradicated weed growth and were non-injurious to the fruit. Simazine applied at the late dormant stage maintained adequate suppression of weeds at 2 lb./acre, and was tolerated at up to 4 lb./acre by raspberries and at 4 lb./acre and more by black currants. On treated plots some hoeing in later summer and mid-autumn was necessary to maintain adequate weed control, while in the winter complete control of weeds was obtained with diquat or paraquat. *Trifolium repens* proved to be particularly suitable as a sward species. Irrigation was essential to prevent reductions in yields of fruit resulting from competition by the sward for available soil moisture during dry periods.—Hort. Res. Stat., Levin.—From *Weed Abstr.*, **14**, No. 95.

7352. Laflin, T.
Mechanizing the blackcurrant harvest. *Agriculture, Lond.*, 1965, 72: 332-6, illus.

Recent trials at Luddington and Efford are summarized on the mechanical harvesting of black currants from cut branches, and on the changes in spacing and planting systems required by this method. [See also *H.A.*, 35: 2987.]

7353. Wilking, E., and von Hardenberg, D.-W., Graf.
Die Ernte von Strauchbeerenobst. **(Harvesting bush fruits.)** *ErwObstb.*, 1965, 7: 108-11, illus.

Manual and mechanical harvesting of red and black currants and blueberries were compared in 1964. Figures are presented for performance (kg./hour), total harvesting time, picking or shaking time and time required for changing containers (all in min./kg.). Output was closely related to variety, both hand picking and shaking being easier with varieties having long, many-berried, free-standing trusses. With black currants mechanical harvesting was 4–10 times, and with blueberries 7–10 times, faster than manual harvesting. With the portable, electrically operated shaking apparatus the best results were obtained with a frequency of 35 vibrations per second. [See also *H.A.*, 34: 4403.]—Inst. Obstb. Baumsch., Sarstedt, and Landmasch.-Inst., Univ. Göttingen.

7354. Skroch, W. A., and Dana, M. N.
Weed seed migration within cranberry bogs. *Abstr. 1964 Mtg Weed Soc. Amer.*, p. 64.

See *H.A.*, 35: 5271 and *Weed Abstr.*, **14**, No. 96.

7355. Hall, I. V., and Aalders, L. E.
The relation between seed number and berry weight in the cranberry. *Canad. J. Plant Sci.*, 1965, **45**: 292, bibl. 3.

A positive correlation was found for cranberries of the cultivar Howes. The data suggested that each additional seed increased the weight of the berry by 36 mg. [For related work on blueberries see *H.A.*, 32: 6196.]—Canada Dep. Agric. Res. Stat., Kentville, N.S.

7356. Mosolova, A. V.
Promising gooseberry varieties for the north-western zone of the RSFSR. [Russian, with English summary 7 lines.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 144-8, illus.

7357. Simakin, V., and Minakova, S.
An effective method [of gooseberry propagation]. [Russian.] *Sadovodstvo*, 1965, No. 5, pp. 25-6.

In trials on the propagation of gooseberries by softwood cuttings the quickest and best rooting was obtained with cuttings taken with a heel from the lower part of the shoot at the end of May. Growth substances increased the percentage rooting but were not essential.

7358. Vitkovskij, V. L.
The structure and life cycle of the buds of gooseberry suckers of various ages. [Russian, with English summary 7 lines.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 58-80, bibl. 9, illus.

The development of suckers was studied on 3 species and 14 varieties of gooseberry during the first 6 years of their growth. Data are presented on the initiation and structure of vegetative and generative-vegetative buds, on the different types of spur and on the differentiation of the apical bud. The 6 phases of flower differentiation are described. [See also *H.A.*, 34: 4404.]

7359. Faustov, V. V.
The effect of mineral nutrition on the winter-hardiness of gooseberries. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 289-90.

Trials are reported in which gooseberry bushes were treated with N, P and K fertilizers, separately or combined. Plants receiving N fertilizer were much more vigorous than those in other treatments, but excessive N application considerably reduced winter-hardiness. Plant growth was poor on the P-fertilized plots. Winter-hardiness was good on plots receiving moderate amounts of N and NP, NK and NPK fertilizers.

7360. Kirtbaja, E. K.
Self-fertility in gooseberries and pollinators. [Russian.] *Sadovodstvo*, 1965, No. 5, pp. 33-4.

In trials on the open and artificial pollination of 7 varieties of gooseberry the percentage berry set was reduced on an average by more than half by emasculation of the flowers. Cross-pollination or pollination with a mixture of pollens considerably increased the percentage fruit set, but the fruits obtained by the second method varied greatly in quality. Data are presented showing the influence of meteorological conditions on the percentage fruit set obtained during open pollination.

7361. Carne, I. C.
Observations on raspberry varieties as grown in the Fraser Valley. *Publ. Minist. Agric. Victoria, B.C.*, **65-14**, revised 1965, pp. 4.

Brief notes on 6 varieties.

7362. Jennings, D. L., and Tulloch, B. M. M.
Studies on factors which promote germination of raspberry seeds. *J. exp. Bot.*, 1965, **16**: 329-40, bibl. 7.

The germination of raspberry seeds was favoured by applying certain combinations of chemical pre-treatment before giving up to 6 weeks of moist-chilling before sowing, by adding 500 p.p.m. GA just before sowing and by providing supplementary light after sowing. The most useful chemical pre-treatment was 20 min. with concentrated sulphuric acid followed by 6 days with 1 % calcium hypochlorite containing an excess of calcium hydroxide. For some seed samples such pre-treatment eliminated the need for a subsequent period of moist-chilling, but for others a 6-week period of moist-chilling was still required. Pre-treatment with higher concentrations than 1 % of calcium hypochlorite, 0·5 % of sodium hypochlorite or 1 % of thiourea, or pre-treatment with the stated concentrations of these chemicals but in each case without the addition of calcium hydroxide, frequently delayed or prevented germination. The results of these studies are in accord with the hypothesis that the germination capacity of raspberry seeds is determined by interactions between growth inhibitors and promoters. Such substances have been detected in blackberry seeds, and it is suggested that a similar situation exists in seeds of the raspberry. [Authors' abstract.]—Scot. hort. Res. Inst., Mylnefield, Dundee.

7363. Roach, F. A.
Raspberry picker gives good results. *Grower*, 1965, **63**: 1320-1, illus.

The machine developed commercially in Oregon for harvesting cane fruits [see *H.A.*, 34: 6474] has now been standardized to work in a 9 ft. row spacing at 1 m.p.h. A crew of 7 is carried on the machine. In trials in 1964 its picking capacity was approximately 22 cwt. per hour in a crop of 3½ tons per acre. The machine has also been adapted to carry a hydraulic ram for inserting posts for training cane fruits.

7364. Marshall, B. J., and Sykes, S. M.
Preventing deterioration of raspberries between picking and processing. *Food Pres. Quart.*, 1964, **24**: 57-60, illus.

It is concluded from the experiments recorded that, whereas most of the yeasts present on the fruit in the field do not grow after picking, a few cells of fermenting yeasts are present which multiply after picking, and these are augmented by contamination from unclean picking containers. The containers should be cleaned and dried before use, and the fruit should be cooled promptly after harvest.—C.S.I.R.O., North Ryde, N.S.W.

Vines—general.

7365. Negrul', A. M., and Asriev, E. A.
A preliminary study on variations in components in the design of experiments. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(4): 38-41, bibl. 1.

Statistical studies are reported on factors which contribute to experimental errors in the assessment of vine yields, including plot size, number of replicates and soil variation. Data are presented on the relationship between yield and numbers of shoots and bunches per vine.

7366. Olivier, P.
Macchine per viticoltura. **(Machines for viticulture.)** *Progr. agric., Bologna*, 1965, **11**: 651-2.

Brief notes on machines for soil cultivation, hail storm prevention, frost protection, maceration of prunings and sprinkler irrigation.

Vines—breeding and varieties.

(*See also* 7544.)

7367. Barrett, H. C.
Genotype of functionally hermaphroditic grape clones. *Fruit Var. hort. Dig.*, 1965, **19**: 9-11, bibl. 1.

Twenty-eight functionally hermaphrodite clones were classified, according to their breeding behaviour, into homozygous and heterozygous types.—Univ. Ill., Urbana.

7368. Georgescu, M.
Variabilitatea conţinutului în zahăr şi a acidităţii mustului la hibrizii de viţă de vie obţinuţi prin încrucişarea soiului Braghină cu diferite soiuri locale şi străine. **(Variations in the sugar content and acidity of the must of vine hybrids obtained by crossing the variety Braghină with different local and foreign varieties.)** [French and German summaries ½ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 231-9, bibl. 10.

The varieties crossed with Braghină were Gordan, Tămîioasă romînească, Pinot gris, Italian Riesling and Muscat de Hamburg. In general, the sugar content of the must was higher in the hybrids than in the parent varieties. Tămîioasă romînească and Italian Riesling, as paternal parents, were particularly successful in transmitting high sugar accumulation to their hybrids. The acidity of the must was very variable in the hybrids, but in most cases was greater than that of the parents. The cross Braghină × Italian Riesling gave rise to a high proportion of hybrids capable of producing high quality wine.

7369. Iyer, C. P. A., and Randhawa, G. S.
Application of Anderson's polygraph analysis in grapes. *Curr. Sci.*, 1964, **33**: 623-4, bibl. 2, illus.

The pictorialized scatter diagram method of tracing phylogenetic trends from an analysis of phenotypic characters was used to study 58 varieties of vine. Variations were estimated in stamen length, panicle length, peeling of bark, tomentum on leaves, number of leaf lobes, adherence of skin to pulp and time of fruit ripening. On the resulting diagram 4 groups could be distinguished, one of which showed predominantly the characters of *V. labrusca* and another the characters of *V. vinifera*. The characters of the varieties in the other 2 groups suggested that they were of hybrid origin. The meiotic behaviour of some of the varieties in each of the groups was in agreement with their position on the diagram. Thus it appears that the method could be used to trace the ancestry of vine varieties.—Indian agric. Res. Inst., New Delhi.

7370. Negrul', A. M., Kac, Ja. F., and Jusupov, H. S.
Local vine varieties of Central Tadžikistan. [Russian, with English summary ⅛ p.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 116-35, bibl. 5, illus.

Vines—propagation and rootstocks.

(*See also* 7542.)

7371. Rives, M.
La germination des graines de vigne. I. Essais préliminaires. **(The germination of grape seeds. I. Preliminary trials.)** [English and German summaries ¼ p. each.] *Ann. Amél. Plantes*, 1965, **15**: 79-91, bibl. 26, illus.

Seeds of the vine varieties Melon and Aligoté were placed in the interstices of polythene grilles, which facilitated observation, and were exposed to continuous mist. No beneficial effects on germination were obtained from the use of kinetin, GA, KNO_3, thiourea, uracil, oxygenated water or softened water, used either as imbibition treatments or in the germination media. Sulphuric acid treatment of the dry seeds improved the germination percentage, as did cold stratification. The seeds became capable of germination just after the grapes had turned colour. Seeds taken from mother-plants of Sauvignon vines grown in solution culture in the greenhouse germinated better than seeds from mother-plants grown in the field.—Stat. Rech. Vitic. Pont-de-la-Maye, Gironde.

7372. Randhawa, G. S., and Negi, S. S.
Preliminary studies on seed germination and subsequent seedling growth in grape. *Indian J. Hort.*, 1964, **21**: 186-96, bibl. 36, illus.

The germination of Rosem-T-Lahore vine seeds dry-stored at 35–40° F. for 0, 1½, 2½, 3½ and 5 months was nil, nil, 10, 32 and 56% respectively. For seeds similarly stored at 65–78° F. (room temperature) the figures were nil, nil, 12, 40 and 62%. In a study of the effect of dry storage for periods up to 3½ months at 35–40° F., followed by 24 hours' soaking in GA or thiourea at various concentrations, the best germination (53%) was obtained with 3½ months' storage followed by soaking in 2,000 p.p.m. GA. The germination of Bangalore Blue seeds stratified at 40° F. for 0, 40, 80, 90 and 120 days was nil, 25, 62, 50 and 45% respectively. In a study on stratification as above, followed by GA or thiourea treatment for 24 hours, the best germination (75%) was obtained with seeds stratified for 80 days and then soaked in 500 p.p.m. GA. Four months after sowing, the growth of Bangalore Blue seedlings raised from seed stratified for 80 days at 40° F. and then subjected to various GA or thiourea treatments was best with 100 and 500 p.p.m. GA.—Indian agric. Res. Inst., New Delhi.

7373. Ermakov, B. S., and Ermakova, V. E.
The initiation of adventitious roots in softwood cuttings of vine. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 55, pp. 99-106, bibl. 14, illus.

Cuttings of 2 vine varieties taken in June were treated with heteroauxin at 50 mg./l. and, together with the controls, were planted in frames. In the cuttings treated with heteroauxin root initials were found in various tissues: in the expanding undifferentiated multicellular cambium, in the peripheral cells of the primary medullary rays adjoining the pericyclic fibres, in the parenchyma of the secondary phloem and in the parenchyma of the primary cortex. In the controls the root initials were found in the peripheral cells of the primary medullary rays adjoining the bast and the pericyclic fibres.

7374. Calabrese, F.
Ulteriori ricerche sugli effetti della bagnatura nella radicazione di talee di vite. **(Further studies on the effects of soaking on the rooting of vine cuttings.)** [English summary 11 lines.] *Riv. Ortoflorofruttic. ital.*, 1965, **49**: 202-12, bibl. 38, illus.

After 4 months' stratification cuttings of the vine rootstocks 140 R and 1103 P were soaked for 24 or 72 hours in cold or tepid (30–55° C.) water before planting. Active growth began first in those soaked in tepid water, irrespective of the duration of treatment, and last in the untreated controls, but 8 months later there were no differences in vigour. Rooting responses of 140 R were greatest to 24 hours in tepid water, whereas with 1103 P very slightly better results were obtained with 72 than with 24 hours. Cold water was less effective for both rootstocks, but significantly increased rooting, more particularly with the longer soaking. Cuttings of 1045 P responded well to water at 25° and 35° C., but 12 hours' soaking in water at 55° C. was lethal.—Univ. Palermo.

7375. Oprea, D. D., and Puiu, Ş. D.
Influenta NPK asupra înrădăcinării viţei de vie. **(The effects of NPK on the rooting of vines.)** [English and German summaries ½ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 221-9, bibl. 24.

In glasshouse trials cuttings of the vine rootstock Kober 5 BB rooted most vigorously when given a complete NPK fertilizer during propagation.

7376. Štapkin, V. I.
The use of bacterial fertilizers in the production of transplants. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(3): 32-5, illus.

The treatment of vine cuttings, before planting, with a water suspension of phosphorobacterin or azotobacterin increased the number of thick roots (diam. 1–3 mm.) and the length of the main root, and reduced the number of fine roots (diam. less than 1 mm.) compared with untreated controls. Shoot growth was also more vigorous on the treated cuttings.

7377. Zilai, J.
A szőlőoltványtermesztés korszerűsítésének néhány biológiai és technikai tényezője. **(Some biological and technical factors in the production of grafted vines.)** [Russian and French summaries 1 p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 179-92, bibl. 22.

Over 5 years studies were conducted on polarity, dorsiventral anatomy of the stem structure and callus formation in vine grafts with the object of improving grafting techniques. A so-called complex method of nursery treatment of grafts was developed. Heavy callusing and excessive shoot formation during the forcing of newly grafted vines, and injury to the new shoots by paraffin treatment, depleted the carbohydrate and especially the P reserves, resulting in poor union. Protecting the union with a rubber band, paraffining before forcing, and treating the new shoots with Vitemol [an anti-transpirant emulsion] before planting in the nursery increased the number of grafts suitable for vineyard planting by 8–10% compared with paraffining after forcing. [See also *H.A.*, 35: 3012.]

7378. Lučenko, V. I., and Lenina, V. I.
Paraffin treatment of grafts. [Russian.] *Sadovodstvo*, 1965, No. 4, p. 35.

Dipping vine grafts rapidly into melted paraffin at 68–70° C. to coat the scion, the union and 6–8 cm. of the rootstock obviated the need for earthing up and resulted in the development of stronger plants on which the wood ripened better.

7379. Mirimanov, A. S., and Podgorskij, Ju. K.
Electric stratification of grafted vines. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(2): 51-3, illus.

The percentage rooting of vines stratified in electrically heated containers was 7·8% higher than that of vines stratified in the greenhouse. The use of electricity for stratification resulted in the production of a higher percentage of plants suitable for transplanting, at a lower cost of production per transplant.

7380. Romanenko, N. N., and Tihvinskij, I. N.
The stratification of grafted plants in electrically heated containers. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(2): 47-50, bibl. 1, illus.

Trials are described in which grafted vines were stratified in containers with heating elements which gave a higher temperature around the point of union than a the base of the plant. As the temperature around the point of union was increased from 21° to 32° C., the period required for stratification was reduced from 19 to 11 days, and a stronger callus was formed.

7381. Constantinescu, G., and Baniţă, P.
Studiul portaltoilor răspîndiţi în viticultura din Republica Populară Romînă. **(A study of the vine rootstocks used in the Romanian People's Republic.)** [French and Russian summaries ½ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 149-59, bibl. 12.

All the pure species rootstocks, except the varieties Riparia Grande Glabre and Rupestris du Lot, made poor growth and were not suitable for the climate and soil of the Drăgăşani vineyard and other Romanian vineyards. Hybrid rootstocks, however, showed heterosis and grew vigorously. This was especially marked in the *Vitis berlandieri* × *V. riparia* hybrids. Compatibility with scion varieties was best in the *V. riparia* rootstocks, followed by the Riparia × Rupestris and the Berlandieri × Riparia hybrids.

7382. Juncu, V., and others.
Comportarea portaltoilor de viţa de vie în podgoria Copou—Iaşi. **(The behaviour of vine rootstocks in the Copou vineyards at Jassy.)** [French and Russian summaries ¼ p. each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 211-20, bibl. 5.

In respect of length and diameter of shoots, growth indices and the production of cuttings and of grafted plants, Riparia Gloire proved to be the best of the 5 rootstocks tested.

7383. Lider, L. A., Ferrari, N. L., and Kissler, J. J.
Effects of several nematode-resistant rootstocks on vine vigor, crop level, and nutrition with the grape variety Grenache. *Amer. J. Enol. Vitic.*, 1965, **16**: 42-8, bibl. 13, illus.

Various treatments were tried to reduce the vegetative growth and increase fruit production in Grenache vines grown on vigorous nematode-resistant rootstocks. Regulating the pruning level in relation to the past vegetative growth did not completely counteract low-yielding tendencies. The fruiting efficiency of individual spurs was lowest on vines on the vigorous rootstock Dogridge and highest on the own-rooted vines. The heaviest yielding and best balanced vines were those grown on the *Vitis champini* Salt Creek selection. Girdling during blossoming markedly increased the total carbohydrate content in the shoots and reduced the total N content, but only improved yields in vines on Dogridge. Topping the vines at blossoming reduced vigour. A foliar spray of 500 p.p.m. MH during blossoming had no effect on shoot nutrient levels but retarded growth late in the growing season.—Univ. Calif, Davis.

Vines—spacing, training and pruning.

(*See also* 7405, 7434.)

7384. Murray, A. F.
Grapevines yield better with correct spacing. *Agric. Gaz. N.S.W.*, 1965, **76**: 217-19, bibl. 2, illus.

On the basis of the results of the experiments described, recommended planting distances are given for 4 categories of vine varieties, i.e. vigorous wine, vigorous raisin, moderately vigorous and varieties of low vigour, under both irrigated and non-irrigated conditions.—Vitic. Res Stat., Griffith.

7385. Csepregi, P.
Újabb tapasztalatok a nagyüzemi tőkeművelés- és metszésmódok területén. **(Recent experiments on the pruning and training of vines in large-scale culture.)** [Russian and French summaries ¾ p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 169-78, bibl. 14.

Under favourable conditions on frost-free, gentle slopes the Moser method of high training, with a spacing of 3×1 or 1·2 m. and pruning to leave 40–50 buds, was found suitable for the western, high quality wine varieties and certain dessert varieties. For general use on sandy soils in Hungary, however, spacing at 2·4×0·5 or 0·6 m., pruning to 10–20 buds and covering in the vines in winter were more satisfactory practices. Methods of improved training and wide spacing are discussed in relation to mechanization.

7386. Cosmo, I.
Scelta del sistema di viticoltura nella pianura padana. **(The choice of a system of vine training in the plain surrounding Modena.)**
Ancora una parola sul sistema a raggi. **(Further notes on the ray system.)** *Riv. Vitic. Enol.*, 1964, **17**: 35-8; 1965, **18**: 321-4, illus.

In the first article the advantages, disadvantages and economics of the ray (Bellussi) and espalier systems of vine training are summarized from data collected during 15 years' observation in the Modena area. In the ray system a spacing of 4×8 m. was more economic than 6×6 m., and both were distinctly superior to espalier planting at 3·5×7 m. In the second article it is shown that the dense massing of foliage where the vines radiate from the supports, which is the major disadvantage of the rhombic overhead wiring for 4×8 m. spacing, can be avoided by lowering the point of radiation and arching the shoots up to the overhead framework. Wind resistance is greater with rhombic than with square wiring.

7387. Constantinescu, G., and others.
Despre unele rezultate cu privire la cultura înaltă a viţei de vie în condiţii de silvostepă. **(Some results on the high trellising of grape vines under forest-steppe conditions.)** [English, Russian and French summaries ⅓ p. each.] *Grăd. Via Liv.*, 1965, **14**(2): 31-7, bibl. 5, illus.

High trellising is recommended for vineyards in regions with mild winter conditions. The highest crops per sq. m. were obtained with the pergola or the storied pagoda systems. The variety Coarnă Neagră proved very suitable for high trellising.

7388. Bruni, B.
Pergolati e tendoni. **(Pergola and "curtain" vine training.)** *Inf. Ortoflorofruttic.*, 1965, **6**: 215-19, illus.

The pergola system, involving small groups of vines, or even single vines, and the "curtain" system, requiring firmer supports and an overhead system of wiring from which the vine shoots hang down, are compared. The latter is described in detail and its advantages are enumerated.

7389. Karapaskal, K. P., and Karpunin, N. S.
Cheap supports for vineyards. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(4): 53.

Training vines on trellises of live honey-locust (*Gledit-*

schia) trees was considerably cheaper than using other methods of support. Nitrogen-fixing nodules which formed on the fine roots of the honey-locusts encouraged root formation in the vines.

7390. Kaiser, G.
Négykarú kordonművelésű tőkék alkalmazásának vizsgálata. (Előzetes követelmény.) **(Investigations on the use of four-arm cordon-trained vines. (Preliminary communication.))** [English and Russian summaries 1 p. each.] *Kísérl. Közlem., Sect. C*, 1964 (issued 1965), **57C**(1): 19-50, bibl. 25, illus.

The training of 4-arm double cordons was started in the spring of the 4th year after planting, with 2 strong shoots providing short (30–35 cm.) horizontal arms at 30 cm. or higher on the stem. One long (55–60 cm.) arm was formed in the 5th and another in the 6th year. The annual replacement of the oldest arm was started in the 7th year. Using the variety Italian Riesling, this method was compared with the traditional earthing-up method of cultivation with regard to the number of buds, shoots and bunches, leaf area, intensity of flowering, sugar production, total yields and yield per shoot. The new method showed great promise, the vines producing 2–2·5 kg. of fruit per 1·2 sq. m. of ground area.

7391. Panyč, N. T.
The estimation of the potential crop in relation to the training of vines. [Russian.] *Vinodelie i Vinogradarstvo*, 1964, **25**(4): 24-30, bibl. 2.

Various methods and formulae are reviewed for estimating the optimum loading of vines.

7392. Balakrishnan, R., Krishnamurthi, S., and Rao, V. N. M.
Effect of pruning severity on the germination of grape pollen. *Madras agric. J.*, 1965, **52**: 81-2, bibl. 3.

The varieties Bangalore Blue, Khandari and Muscat were pruned to spurs bearing 4–16 buds. Increased severity of pruning reduced pollen germination, the differences in the percentage germination of pollen between the most severe and the least severe treatments being 3·7%, 17·2% and 7·4%, respectively, for the 3 varieties.—Agric. Coll. and Res. Inst., Coimbatore.

7393. May, P.
The effect of different methods of attaching sultana canes to the trellis wire. *Aust. J. exp. Agric. Anim. Husb.*, 1965, **5**: 87-90, bibl. 6, illus.

Omitting the standard practice of twisting sultana canes around the trellis wire during pruning did not reduce bud burst, the percentage of fruitful shoots, yield, or the number of canes available for next season's pruning. [From author's summary.]—C.S.I.R.O., hort. Res. Sect., Glen Osmond, S. Australia.

7394. Palamarčuk, G. D., and Suharev, E̊. A.
The mechanization of tying-in green shoots. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(2): 57-9.

Studies were conducted, in connection with the development of machines and equipment for tying-in vine shoots, on the friction force between the shoots of 10 vine varieties and different types of string and trellis work, and on the flexibility of the shoots.

Vines—forcing and climatic factors.

7395. Pavlov, N.
A study on the efficacy of polythene greenhouses used to cover table grapes in order to hasten ripening. [Bulgarian, with French and Russian summaries ¾ p. each.] *Grad. lozar. Nauka*, 1965, **2**: 241-55, bibl. 13, illus.

In these experiments, carried out with the vine varieties Julski Biser and Bolgar, alternate plots of 5 rows were covered with portable polythene houses from February-March to mid-June. In both varieties development was accelerated and harvesting was advanced by 15 to 20 days on the covered plots. Since the different stages of growth lasted the same length of time and required the same temperature sum in the covered and the uncovered plots, it is concluded that the hastening of maturity was occasioned by the earlier onset of the various growth stages, induced by the higher temperatures under cover. Forcing apparently caused no reduction in yield.

7396. Lojko, R. Ė.
Growing vines under plastic. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(4): 35-8, bibl. 1.

In studies on 4 varieties mulching and covering the vines from the beginning of bud burst (May) until harvest with polythene film increased fruit set, quality and yields and accelerated maturity. Covering the vines from the beginning of flowering (June) accelerated ripening but did not influence fruit quality or yields.

7397. Juncu, V., and Popescu, G.
Stabilirea modului de îngropare la viţă de vie în condiţiile podgoriei Copou—Iaşi. **(Establishing a method of covering vines with soil under the conditions of the Copou vineyards at Jassy.)** [French and Russian summaries ¼ p. each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 221-8, bibl. 6 illus.

By covering vines in winter with a continuous ridge of soil, 12 cm. high up to the branches and 8 cm. above the branches, the mortality of buds was reduced by 5–17% and the grape yields in the following season were raised by 16–18%, compared with vines covered in the conventional manner.

7398. Ivančenko, A.
The mechanization of uncovering vines. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(2): 53-6, illus.

A description of various types of machinery employed.

7399. Molčanova, Z. Ja.
Changes in the storage substances in the cells of grape vine buds during the winter period. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(2): 32-4.

Studies are reported on the buds and shoots of vines of 3 varieties, which had either remained uncovered or been covered with soil during the winter period. The percentage of tannin-containing cells in the buds, which varied with variety but not between uncovered and covered vines, fell during the dormant period. Temperature conditions in November and December initiated the hardening of the vines, which was characterized by increased hydrolysis of the cell starch contents. Uncovered vines, which had to survive lower temperatures, had a higher content of storage substances than covered vines. Fats were found in the bud tissue in a single layer of marginal cells only. By the end of

February or beginning of March no lipoids were present in the buds. Shoot tissue contained large amounts of starch which was later converted to sugars, but no lipoids were detected. Tannins were found only in some cells of the medullary rays.

7400. Koleda, I.
Szénhidrátok változása szőlővesszőben és rügyekben a nyugalmi időszak alatt. (**Changes in the carbohydrate content of vine shoots and buds during dormancy.**) [English and Russian summaries 1 p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 245-64, bibl. 47.

Carbohydrate metabolism was studied in 8 vine varieties in relation to frost resistance. In the shoots one starch maximum was observed in the autumn and another in the spring. The autumn maximum coincided with the deepest point of biological dormancy. After leaf-fall the content of starch decreased and that of sugars increased, reaching a peak during the coldest part of the year (the end of January or early February). Differences were noted in the carbohydrate metabolism of the varieties tested. The sugar content of the more frost-resistant varieties was not consistently higher than that of the less resistant varieties. Frost resistance was highest at the time of maximum sugar accumulation. Carbohydrate metabolism in the buds was similar to that in the shoots, except that during cold weather the buds contained more soluble sugars. [See also *H.A.*, **33**: 4761.]

7401. Grinenko, V. V., and Bondareva, Ju. S.
The protective reactions of the grape vine and its adaptation to winter conditions. [Russian, with English summary ½ p.] *Fiziol. Rast.*, 1965, **12**: 99-109, bibl. 25.

Varieties differing in winter hardiness were grown in 3 different climatic regions, and the water-retaining characteristics of the cells were studied during the period July to March. Following high summer temperatures, the falling temperatures of autumn were accompanied by an increase in the capacity of the cells to retain water when immersed in hypertonic sucrose solutions. The increased water-retaining capacity of the cells was associated with increases in the amount of colloidally bound water and in the degree of hydration and resistance to denaturation by heat of the protoplasmic colloids, but the amount of osmotically bound water was not greatly affected. The size of the responses depended on the degree of winter hardiness of the variety. A temperature of −22·8° C. reversed the effects in all but the most resistant variety studied. An increased water-retaining capacity of the cells with falling temperature was not observed in a temperate region with a cool summer.

7402. Pogosjan, K. S., and Skljarova, I. A.
The behaviour of grape vines during thawing and subsequent frosts. [Russian.] *Agrobiologija*, 1965, No. 1, pp. 127-30, illus.

The frost resistance of cuttings from naturally hardened vines, grown under South Armenian conditions, was high, both at the beginning and at the end of January, but was considerably reduced following slow thawing. Under conditions of slow thawing the sugar contents, particularly the contents of monosaccharides, decreased and the starch contents increased. Repeated hardening of the cuttings increased their frost resistance. Chromatographic studies showed that the types of sugar present were affected by thawing, subsequent freezing, date of sampling and variety.

7403. Reichardt, A., Reuther, G., and Weise, R.
Der Einfluss von Sorte und Entwicklungsstadium auf Konzentration und Inhaltsstoffe des Zellsaftes junger Rebentriebe im Hinblick auf ihre Spätfrostresistenz. (**The effect of variety and growth stage on the concentration and composition of the cell sap of young vine shoots in relation to their spring frost resistance.**) [French and English summaries ½ p. each.] *Weinberg u. Keller*, 1965, **12**: 111-30, bibl. 60, illus.

In a 3-year investigation on the Rieslaner, Scheurebe, Perle and Riesling varieties the osmotic value and the contents of sugars and amino acids of the cell sap were determined at 6 growth stages ranging from before bud-burst to when the shoots were 7–10 cm. long with 4–5 opened leaves. Varietal differences existed and were dependent on the growth stage. The variety Perle showed relatively good frost resistance in its early growth stages and came into leaf late. Osmotic pressure, monosaccharide content and frost resistance were lower when the first leaves were unfolding than at bud-burst or at later growth stages.—Bayer. Landesanst. Wein-, Obst- u. Gartenb., Würzburg.

7404. Moore, J. N., Sistrunk, W. A., and Vaile, J. E.
Response of grape varieties to drought. *Arkans. Fm Res.*, 1964, **13**(6): 5.
Grape variety performance under drought conditions. *Fruit. Var. hort. Dig.*, 1965, **19**: 3-6.

Yields, fruit quality and drought resistance are reported for a number of American bunch-grape and French hybrid varieties on their own roots, subjected to severe drought and heat conditions during the summer of 1964. The varieties most resistant to drought were USDA Meridian 17, SV 12-327 and America. Most of the varieties tolerating the weather conditions were derived from crosses involving *Vitis lincecumii* or *V. rupestris*.

7405. Pomohaci, N.
Cercetări privind comportarea soiului Chasselas în primul şi al doilea an după grindină. (**A study of the behaviour of the vine variety Chasselas in the first and second years after hail.**) [English and French summaries ½ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 213-20, bibl. 10.

Several methods of assisting the recovery of hail-damaged vines were investigated. When the damage occurred after flowering, pruning to 3 buds weakened the plant, and pruning to below the damaged tissues resulted in yield increases insufficient to cover the cost. It was found advisable to retain as many of the remaining leaves as possible and to hasten the production of new leaves by measures other than summer pruning. In the following year the bud load should be spread over more and shorter shoots (6–8 shoots bearing 7–8 buds each.) [See also *H.A.*, **35**: 5313.]

Vines—soils and soil management.

(*See also* 7144.)

7406. Ragimov, K. S.
The use of mountain slopes. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(2): 39-43, illus.

Terracing methods and cultural practices for vines in Azerbajdžan.

7407. LAMMEL, K.
A hegyvidéki szőlők művelésének gépesítési lehetőségei. (The possibilities of mechanization in hillside vineyards.) [English and Russian summaries ⅓ p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 221-9, illus.

Terracing and contour planting in relation to mechanical [illegible] cultivation.

7408. ABBASOV, M.
The effect of deep cultivation on the yielding capacity of vines under irrigated conditions. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(3): [illegible]

Trials are reported on the effects of a single deep ploughing (55–60 cm.) or shallow ploughing (35–40 cm.), with or without fertilizers, on the subsequent yield of vines, compared with normal [surface] cultivation. The average yield increase over a 3-year period was greatest (30·2%) with deep ploughing and the application of $N_{135}P_{135}K_{90}$ fertilizer.

7409. DADAŠEV, G. S.
The value of deep cultivation of the inter-rows under dryland conditions. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(3): 46.

Cultivation of the inter-rows in vineyards to a depth of 50–60 cm., together with the application of $N_{120}P_{120}K_{45}$ fertilizer, before the heavy autumn rains considerably increased vine yields compared with those on uncultivated or shallow-cultivated plots. The berry sugar content of vines on deep-cultivated plots was slightly less than that of the controls.

7410. TARLAPAN, M. I.
Herbicides and the problem of summer cultivations. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(3): 26-31.

The effects are discussed of various numbers of summer cultivations and of applications of herbicide (1% DNC) on the physical properties and the nutrient contents of the soil. Average vine shoot growth, yields and individual bunch weights over a 4-year period were greater on plots receiving a single cultivation + 2 applications of herbicide, or no cultivation but 3 applications of herbicide, than on plots receiving 4 cultivations. Yields were higher on all plots receiving herbicide, with or without cultivation, than on the cultivated controls. Treatment with herbicide also reduced the incidence of grey mould.

7411. EISENBARTH, H. J.
Die Möglichkeiten der chemischen Unkrautbekämpfung im Weinbau; unter besonderer Berücksichtigung der Verhältnisse an der Mosel. (**Possibilities of chemical weed control in vine growing, with special reference to conditions on the Moselle.**) [French and English summaries ½ p. each.] *Weinberg u. Keller*, 1965, **12**: 93-100, bibl. 4, illus.

With the use of the recommended pre- and post-emergence herbicides weeds can be controlled throughout the season. A mixture of Domatol Spezial W (simazine + aminotriazole + MCPA) and Primatol D-43 (atrazine + CMPP + 2,4,5-T) controlled bindweed (*Convolvulus arvensis*).

7412. LALATTA, F., AND BIASINI, G.
Prove sul diserbo chimico del vigneto. (**Tests on the chemical control of vineyard weeds.**) *Riv. Vitic. Enol.*, 1965, **18**: 241-51, bibl. 9, illus.

A mixture containing 36% ATA and 18% simazine, applied in early April at 15 kg. ha., controlled vineyard weeds excellently except for *Convolvulus arvensis* and *Asparagus* sp. Good control was achieved with simazine at 10 kg./ha., and rapid but less lasting control with Chlorophenocarb. At 5 kg./ha. N-(3-trifluoromethyl)-N′,N′-dimethylurea was inferior to the ATA-simazine mixture at 15 kg./ha. All the products caused chlorosis if the spray was allowed to come in contact with the vine leaves, but were otherwise harmless.—Ist. Fruttic. Elettrogen., Roma.

7413. CONDEI, G., AND TUDOR, T.
Folosirea eficientă a lupinului ca îngrăşămînt verde în viile pe rod. (**The efficient use of lupins as a green manure crop in bearing vineyards of the Drăgăşani vine-growing area.**) [English, Russian and French summaries 8 lines each.] *Grăd. Via Liv.*, 1965, **14**(3): 19-24.

In 5 years' trials a green manure crop of yellow lupins successfully replaced the use of FYM. Its efficiency was increased by the addition of PK fertilizers and lime.

7414. ALEXANDRESCU, I., GRUMEZA, N., AND IONESCU, P.
Unele aspecte privind comportarea soiului Afuz-Ali în cultura irigată. (**Some aspects of the response of the Afuz-Ali [vine] variety to irrigation.**) *Grăd. Via Liv.*, 1965, **14**(4): 32-7.

Notes are given on the effect of 6 different irrigation regimes on the physico-chemical characteristics of the soil and on growth and yield. Costs are discussed.—Stat. exp. vitic., Murfatlar.

7415. KOBAYASHI, A., IWASAKI, K., AND TERANUMA, T.
Pollen germination and berry set, growth and quality of Delaware grapes as affected by soil oxygen concentration. [Japanese summary ¼ p.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 265-72, bibl. 4, illus.

In trials on potted vines a low soil O_2 concentration, from 20 days before bloom up to harvest, retarded pollen germination and berry set in the current year. Reduction of the O_2 concentration from 15 days after berry set to the time of harvest resulted in poorer vine growth, fruit quality and yields. The leaf contents of P, K and Mg fell more markedly than the leaf N content as the soil O_2 concentration was reduced. A highly significant correlation was found between the percentage pollen germination and the leaf contents of P and K. The respiration of excised roots decreased as the soil O_2 concentration was reduced, and at concentrations of less than 5% the output of CO_2 by the roots was greater than their O_2 uptake.

Vines—nutrition.

(*See also* 7169, 7178, 7511.)

7416. ALEXANDER, D. MCE., AND WOODHAM, R. C.
Determining the nutrient needs of vines: an aerial layering technique requiring few vines. *Aust. J. exp. Agric. Anim. Husb.*, 1965, **5**: 80-4, bibl. 8, illus.

Using single canes *in situ* as experimental plots an NPK fertilizer trial was applied to 6 sultana vines. Roots formed on the canes by aerial layering were enclosed in pots to which separate fertilizer treatments were applied during the following growing season. The effects of the fertilizer on fruit and shoot development on the distal side of the pot were observed. Results from this trial were compared with those from an adjacent conventional field trial in which yield increases were obtained with N. Advantages of the technique for screening fertilizer elements are discussed. It is suggested that similar techniques might be used with advantage on other horticultural plants. [Authors' summary.]—C.S.I.R.O., hort. Res. Stat., Merbein, Vict.

7417. Kozma, P., and Polyák, D.

A növény kémiai analízisének felhasználása a szőlőültevény táplálkozási viszonyainak megállapítására. **(The use of chemical analysis for determining the nutrient status of vines.)** [Russian and French summaries 1 p. each.] *Kert. szől. Föisk. Közlem.*, 1964, **28**(1, part 2): 149-68, bibl. 8, illus.

Analyses were made on the leaves, shoots and roots of rooted vine cuttings grown in sand culture with different nutrient solutions, and also in potting soil and in the open. Root growth in the potting soil and with suitable nutrient solutions was more vigorous than in the open. The N contents of the leaves and roots were approximately similar, and higher than that of the shoots. With increasing rates of N application the total N contents of the individual organs increased, but only within a relatively narrow range. The range of P content was very wide, treatments often showing as much as 400% difference in values. Increasing P applications always increased the P content of all the organs studied. Increasing rates of P with a constant N supply also increased the N values. The K content of the plants closely followed the K concentration of the nutrient solution. Increases in N and P supply also increased the K content. The K content in some leaves exceeded the N content. The roots showed less K than the leaves or shoots.

7418. Sárosi, M.

Untersuchungen zur Kontrolle der Ernährung der Reben durch Blattanalyse in Ungarn. **(Studies in Hungary on the control of vine nutrition by foliar analysis.)** [English, French and Spanish summaries ⅓ p. each.] *Mitt. Klosterneuburg*, *Ser. A*, 1965, **15A**: 51-62, bibl. 5.

Work from another Hungarian source on the factors affecting vine leaf composition, with special reference to K deficiency, is summarized. Original studies on lime-induced chlorosis are reported in detail. Chlorotic leaves were much poorer in Mn, and in most cases actually richer in Fe, than normal leaves. There was little or no difference in leaf B. The application of a mixture of iron sulphate and manganese sulphate practically eliminated chlorosis within 2 months, but manganese sulphate plus acid peat did not significantly improve leaf colour. Spraying 3 times with a mixture of manganese sulphate and Fe-EDTA completely cured the chlorosis, but manganese sulphate plus zinc sulphate had no effect. In another experiment manganese sulphate alone increased leaf growth by 44%, and in combination with zinc sulphate by 59%. Foliar application of chelated Fe+Mn or Fe+Zn cured chlorosis more successfully in rootstocks than in grafted vines. In a locality where chlorosis was absent leaf Fe averaged 100 p.p.m. and leaf Mn below 50 p.p.m. On calcareous clay soils, however, leaf Mn was sometimes as high as, or higher than, leaf Fe in healthy vines, and Fe levels in the chlorotic vines ranged from 92 to 169 p.p.m. Severe chlorosis on calcareous soils was completely cured by Fe-EDDHA [method of application not stated]. This treatment increased Fe and reduced Mn in the leaves. Analyses carried out in another chlorosis-free area showed that leaf Fe was normally much higher in the autumn than in the spring but that Mn values were approximately the same at both seasons. Values not lower than 100 p.p.m. for leaf Fe in the autumn are considered satisfactory. Incipient chlorosis was checked in one area by painting summer pruning wounds with Fe solutions, the 10% chelate being more effective than the 20% sulphate. Sand culture experiments confirmed that Fe nutrition was deficient when the leaves contained less than 100 p.p.m. of Fe and more Mn than Fe, and also that Fe-EDDHA was a much more effective Fe source than the chloride. The substitution of mixtures of organic manures and iron chloride for the much more costly chelate was unsuccessful. It was found that FYM rendered inorganic Fe non-available but did not reduce the availability of chelated Fe.—Res. Inst. Ampel., Budapest.

7419. Gärtel, W.

Über die Ursachen der Chlorose auf verdichteten Kalkböden. **(The causes of chlorosis on compacted calcareous soils.)** [English and French summaries ⅔ p. each.] *Weinberg u. Keller*, 1965, **12**: 143-64, bibl. 58, illus.

A review on the changes in soil composition caused by poor aeration which lead to nutritional problems of the vine and to chlorosis.

7420. Turno Rotini, O.

La concimazione delle uve da tavola. **(The manuring of table-grape vines.)** *Progr. agric.*, *Bologna*, 1965, **11**: 609-14, illus.

A review, dealing with N, P, K, S, Cu, Mo, Mn, B and Zn, and emphasizing the adverse effects of excess N.

7421. Cehmistrenko, P. E.

The importance of individual mineral elements (nitrogen, phosphorus and potassium) in the production of hybrid vine seedlings. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 206-15.

Soil applications of large amounts of compost and N, P and K fertilizers, 1 month before sowing, considerably increased the percentage germination of hybrid vine seeds, and resulted in earlier cropping. Large amounts of N resulted in the development of vigorous, early maturing shoots. Applications of large amounts of P and K fertilizers also improved wood ripening, but did not increase vine vigour compared with the untreated controls. Applications of P, N and K fertilizers, in that order, accelerated fruiting. Organo-mineral fertilizers increased the number of seedlings which developed over-wintering fruit buds in both the year of sowing and the year of transplanting. During selection for fruit quality, the highest percentage of promising seedlings was obtained from N-treated plots. A direct relationship was found between seedling vigour in the first year and time of cropping.

7422. Martin, T., and others.

Influenţa stropirilor extraradiculare cu microelementele mangan, bor şi cobalt asupra viţei de vie. **(The effect of foliar applications of the micronutrients manganese, boron and cobalt on vines.)** [German and Russian summaries 1 p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 161-73, bibl. 25.

The vine varieties Aligoté and Welsch-Riesling were sprayed with B, Mn and Co before blossoming and during berry growth. On the second day after spraying increases were noted in the photosynthetic, respiratory and catalase activities, the increases being considerably greater in Welsch-Riesling than in Aligoté. The micronutrients also improved fruit set, Mn having the greatest effect on Aligoté and B on Welsch-Riesling. The total and individual weights of grapes were raised to a greater extent in Welsch-Riesling than in Aligoté and more by Co than by B. The increase in sugar content followed a similar pattern, being higher in Welsch-Riesling and in the Co-treated plants.

7423. Christensen, P.
Potash needs show on grape vineyards. *Bett. Crops*, 1965, **49**(1): 12-15, illus.

When vines in localized K-deficient areas within a vineyard were given 5 lb. K_2SO_4 per plant yields were increased by 45% in the first year and by 146% in the year following treatment.—Univ. Calif., Fresno.

Vines—growth, physiology and reproduction.

(*See also* 7233, 7392, 7399-7403, 7415.)

7424. Penkov, M., and Kenderov, M.
Studies on the distribution of vine root systems in the Songurlar valley. [Bulgarian, with French and Russian summaries ⅓ p. each.] *Grad. lozar. Nauka*, 1965, **2**: 235-9.

7425. Litvinov, P. I., and Štapkin, V. I.
Root hairs and their role in increasing the absorbing surface of the root system. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(4): 30-4, bibl. 4, illus.

The lengths and diameters were measured of root hairs on the roots of seedlings of 10 vine varieties and on the roots of cuttings of 2 varieties. The root hair diameters varied only slightly between varieties. Root hair length, however, was correlated with the characteristic vigour of the particular variety. No substantial differences were found between root hair length and diameter on the main roots of seedlings and on the adventitious roots of cuttings. Root hairs began to develop about 1·5 mm. and 3 mm. from the apex in weak and vigorous vines, respectively, the total length of the root-hair zone varying from 1 to 3 cm. The numbers of root hairs per sq. mm. of absorbing root ranged from 300 to 400. The presence of root hairs increased the area of absorption by 2–5 sq. mm. per sq. mm. of absorbing root surface area. Root hairs did not develop when vines were grown in water.

7426. O'Leary, J. W.
Root-pressure exudation in woody plants. *Bot. Gaz.*, 1965, **126**: 108-15, bibl. 22.

Root-pressure exudation was exhibited by detopped root systems of young vines and young seedlings of tulip tree, birch and red maple, but not by loblolly pine, white spruce and sugar maple. The salt concentration of the root-pressure exudate was always greater than that of the external solution. When solution was pushed through the root systems by applying a pressure of 1 atm. to the solution surrounding the roots, the volume of exudate increased considerably and its salt concentration decreased. Nevertheless, the total amount of salt delivered per unit of time increased. Completely suberized root systems of dormant vines exhibited copious exudation when detopped. Their response to detopping and to the application of pressure to the solution surrounding the roots was, qualitatively, very similar to that of actively growing vine root systems. Root-pressure exudation was manifested by individual, excised, actively growing, white root tips from all 7 species. An increase in solution temperature from 24° to 34° C. increased the yield of exudate from individual roots of pine and spruce more than 7 times. The rate of exudation from single roots of vine and white spruce was reduced by sodium azide. Individual excised roots of loblolly pine that were completely suberized exhibited considerable exudation. In fact, after a 24-hour lag, the rate of exudation from these roots began to increase rapidly, soon surpassing the exudation rate from actively growing roots. Removal of the epidermal layer from unsuberized vine roots appeared to increase root-pressure exudation. [From author's abstract.]—Duke Univ., Durham, N.C.

7427. Fallot, J.
Sur la prolifération des tissus de *Vitis* et d'autres végétaux. Rôle des bourgeons. Action des bactéries. **(Tissue proliferation in vines and other plants. The role of buds. The action of bacteria.)** [*Publ.*] *Centre nat. Rech. sci.*, 1964, pp. 170, bibl. 15 pp., illus.

In tissue culture studies it was found that the ability of the secondary meristems of vines to proliferate varied with the variety and species, and this ability was not entirely dependent on the activity of the primary meristems. *Bacillus megaterium*, *Beijerinckia indica*, *Azotobacter chroococcum* and *Sarcinia lutea* induced cellular division in cultured tissues of vine, Jerusalem artichoke and/or tobacco.—E.N.S.A.T., Fac. Sci., Toulouse.

7428. Trippi, V. S.
Studies on ontogeny and senility in plants. IX. Clone behavior of *Vitis vinifera* var. Malbeck, in relation to senility. *Phyton, Argentina*, 1965, **22**: 35-9, bibl. 23.

Ontogeny was studied comparatively in 3-, 10- and 30-year-old plants of the grapevine. The 10-year-old plants had the longest branches and internodes and the highest amylase activity, and their leaf extracts had the greatest capacity for inhibiting seed germination and for promoting fungal growth. The leaf N content, the capacity of the tissue for IAA destruction and the number of leaves per branch were highest in the youngest plants. These results are discussed in relation to the phenomena of ageing and death. [From author's abstract. For part VII see *H.A.*, 35: 3693.]—Univ. Cuyo, Mendoza.

7429. Todorov, C.
The morphogenesis of latent buds in the vine. [Bulgarian, with French and Russian summaries ⅔ p. each.] *Grad. lozar. Nauka*, 1965, **2**: 225-33, bibl. 6, illus.

Microscopical examinations were made of the latent buds of the varieties Puhljakovski and Aligoté. These showed that the buds developing in the old wood arose from deep in the woody tissue. The meristem of these buds proliferated to form a colony of buds on the surface of the old wood. Latent buds formed before the vine was planted retained their capacity for breaking throughout the life of the plant.

7430. Țîrdea, C., Minuț, P., and Rădescu, N. Conțribuții la studiul distribuției lăstarilor fertili la soiurile de viță roditoare. **(A contribution to the study of the distribution of fertile shoots on vines.)** [French and Russian summaries ½ p. each.] *Lucr. ști. Inst. agron Iași*, 1964, pp. 229-36, bibl. 2.

A mathematical equation is presented for determining the density of distribution. The density and the dispersion of the fertile shoots were shown to be characteristic of the individual vine and not to be affected by seasonal conditions.

7431. de Barros, M. A. A. Ocorrência de domácias em espécies e híbridos da família Vitaceae. **(The occurrence of domatia in species and hybrids of the family Vitaceae.)** [English summary ½ p.] *An. Esc. sup. Agric. Queiroz*, 1963, **20**: 241-56, bibl. 14, [received 1965].

Domatia were found in 95 out of the 157 hybrids studied.

7432. Mohanakumaran, N., and others. **Estimation of leaf area in some varieties of grapes.** *S. Indian Hort.*, 1964, **12**: 50-61, bibl. 16.

The length of the lamina and the leaf area were studied in 200 leaves of different ages and sizes from each of 4 varieties. The area of leaves with the same lamina length differed markedly between varieties. The range of values of lamina length and leaf area also varied with variety. It was not possible to construct a single polynomial equation for all the varieties studied.—Agric. Coll. and Res. Inst., Coimbatore.

7433. Mohanakumaran, N., Krishnamurthi, S., and Rao, V. N. M. **Influence of leaf area on the yield and quality of some varieties of grapes.** *S. Indian Hort.*, 1964, **12**: 29-49, bibl. 35.

The influence of the original leaf area borne by the cane (past season's wood) on fruit yield and quality, and the influence of the leaf area borne by the current season's shoots on the development of the bunch and its quality, were studied in the vine varieties Bangalore Blue, Khandari and Muscat of the same age and grown under identical conditions. A positive and highly significant correlation was established between the original leaf area on the cane prior to pruning and the weight of the bunches borne in the subsequent season in all the varieties, but there was no correlation between the leaf area and the number of bunches. A positive and highly significant correlation was also found between the original leaf area on the cane and each of the following fruit characters: (i) the percentage of total soluble solids, (ii) the percentage of reducing sugars and (iii) the sugar-acid ratio. A negative correlation between the original leaf area on the cane and the fruit acidity was significant in the variety Muscat but was not significant in the other 2 varieties. In general, a greater leaf area promoted fruit quality up to a certain point, beyond which it was not beneficial. The number of leaves borne by each current season's shoot seemed to determine to a large extent the nature of the bunch borne on it. An increase in the leaf area resulted in a proportionate increase in the weight of the bunch. In the absence of leaves the development of the bunch was poor in all 3 varieties, but in the presence of leaves the bunch characters differed among the varieties. A positive and highly significant correlation existed between the leaf area on the current season's shoots and the size of the berries. The maximum berry size was obtained when the leaf area per bunch was 2,243·38 sq. cm., 1,633·94 sq. cm. and 1,047·61 sq. cm. in the varieties Bangalore Blue, Khandari and Muscat, respectively. The leaf area of the current season's shoots was positively and significantly correlated with the percentage of total soluble solids, the reducing sugars and the sugar/acid ratio in the fruit, and negatively correlated with the acidity. Highly acid and immature (green) berries resulted from the "no leaf" treatment in all varieties. [From authors' summary.]—Agric. Coll. and Res. Inst., Coimbatore.

7434. Janin, G. I. **One method of increasing cropping capacity.** [Russian.] *Sadovodstvo*, 1965, No. 6, pp. 28-9, illus.

In 3 years' studies some of the leaves on 1-year-old vine shoots were removed, leaving 5, 10 or 15 leaves per shoot, or 10 leaves on each main shoot plus 2 leaves on each lateral. Control shoots were allowed to develop normally. Observations were made on the photosynthetic activity, intensity of transpiration and accumulation of chlorophyll in the leaves, and on changes in leaf size, stomatal area, cropping capacity, quality of the grapes and ripening of the shoots. Maximum yields and best fruit quality were obtained on vines with 10 leaves on the main shoots and 2 leaves on the laterals. The beginning of flowering was the best time for removing the leaves.

7435. Amirdžanov, A. G. **The optimum relationship between the leaf area and yield of grape vines in connection with the carbohydrate balance.** [Russian, with English summary ½ p.] *Fiziol. Rast.*, 1965, **12**: 13-21, bibl. 14.

The product of the leaf area of a vine and the number of days between fruit inception and ripening was called the "photosynthetic potential". This value was varied by removing some of the leaves or by altering the harvest date. On the basis of previous data, the leaf area was regulated according to the expected yield, which was artificially lowered in one treatment by removing about half of the inflorescences. The ratio of yield to "photosynthetic potential" did not vary greatly, but the values obtained indicated that plants under conditions of normal commercial cultivation had a higher than optimum ratio of leaf to fruit. It is suggested that the relationship between yield and "photosynthetic potential" would be a useful measure of the effectiveness of cultural treatments which affect the ratio of leaves to fruit.

7436. Honda, N., and Okazaki, M. **Studies on photosynthesis and respiration in vine leaves. I. Photosynthesis (1).** [Japanese, with English summary 1 p.] *Sci. Rep. Fac. Agric. Okayama*, 1965, No. 25, pp. 11-23, bibl. 18, illus.

The effects of temperature and artificial shading were studied on the photosynthetic activity of the leaves of 5 vine varieties. The relative values of the photosynthetic activity of the vines were estimated under outdoor conditions and at 23°, 28° and 33° C. A temperature of 23° C. appeared to be the most favourable for photosynthesis, but this was less evident in August than in June. The relative values were also estimated on vines exposed to full sunlight and under 15%, 25% and

40% shade. The influence of shading on photosynthetic activity varied with variety. On the vines exposed to full sunlight the photosynthetic activity of all 5 varieties showed the same seasonal trend.

7437. GOLODRIGA, P. JA., AND HĖ PU-ČAO.
Earliness in vines in relation to some biochemical characteristics. [Russian, with French summary.] *Tr. Vses. Inst. Vinodel. i Vinograd. "Magarač"*, 1963, **12**: 74-83, from *Ref. Ž. (55. Rasten.)*, 1964, Abstr. 10.55.325.

Tests on a variety collection in the Crimea showed that the highest catalase and peroxidase activities occurred in early vine varieties. In medium-early and late varieties the activity of these enzymes was lower. A higher polyphenoloxidase activity during the early growth stage (12–14 May) was observed in late varieties. The highest enzyme activity in all varieties was recorded in young leaves at the beginning of growth.

7438. KALANOV, B. Š.
The development of the vascular system of the peduncle, inflorescence and bunch. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(2): 37-9, illus.

Anatomical studies are reported on the differentiation of the vascular tissue in 4 vine varieties, which showed considerable differences in the size, compactness and shape of the fruit bunches.

7439. KALANOV, B. Š., AND MOLČANOV, V. L.
The characteristics of inflorescence development in different vine varieties. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(2): 35-7.

Inflorescence development up to the time of the opening of the bud that produced the fruiting shoot was similar in 4 varieties, which differed considerably in bunch size, compactness and shape. After this stage, however, development varied with variety and environment.

7440. DVORNIC, V., AND GEORGESCU, M.
Date noi privind studiul florilor la soiul Cadarcă. **(New facts about flowers of the Cadarcă vine variety.)** [Russian, French and English summaries ⅓ p. each.] *Grăd. Via Liv.*, 1965, **14**(4): 37-43, bibl. 9, illus.

Under adverse environmental conditions in Romania the Cadarcă vine produces racemes containing some flowers with degenerated ovaries.

7441. OPREA, D. D., AND OPREA, C.
Anomalii florale întîlnite la soiul Furmint. **(Flower anomalies in the vine variety Furmint.)** [French and Russian summaries ⅔ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 191-211, bibl. 67, illus.

It is considered that the comparative frequency of the various types of abnormal flower occurring on this variety reduce its yield, and that plants producing such flowers should be rogued.

7442. TILL, M. R.
The sensitivity of fruit growth rate to the water balance of the plant. *Aust. J. exp. Agric. Anim. Husb.*, 1965, **5**: 85-6, bibl. 7.

The results of a limited number of diffusion pressure deficit measurements of the leaves and fruit of grape vines are presented, and indicate that the ripe fruit may be insensitive, but that green fruit is sensitive, to the state of the water balance of the plant. [From author's summary.]—Dep. Agric., Adelaide.

7443. LEONARD, O. A.
Translocation of photosynthate, 2,4-D and 4-amino-3,5,6-trichloropicolinic acid in the grape vine. *Abstr. 1964 Mtg Weed Soc. Amer.*, pp. 81-2.

New vine shoots were exposed to $C^{14}O_2$ (1) before flowering, (2) at flowering, (3) when the fruits were one-third full-sized and (4) when the fruits were full-sized. The entire shoots were then treated with 2,4-D amine to kill them, and were collected (a) immediately, (b) after 3 days, (c) after 21 days or (d) when the fruits were full-sized, for autoradiography and counting of a selected portion. The rest of the vine was also sampled for autoradiography. The experiment was repeated using both 2,4-D and picloram at stages (3) and (4). Treatments before flowering resulted in no 2,4-D or C^{14} being translocated out of shoots for 21 days afterwards, though labelled material was present in the main body of the shoot when the fruit was full-sized. No 2,4-D injury was observed on shoots of the current season or on regrowth from stumps. When treatments were made at flowering, translocation out of the shoots was slight after 3 days but appreciable after 21 days and when the fruit had attained full size. There were symptoms of 2,4-D injury on the regrowth from stumps from the 21-day and later collections. In treatments made at stage (3) there was marked translocation of C^{14} and 2,4-D (or C^{14} and picloram) from treated shoots. Although shoots of the current season were rarely injured, the regrowth from stumps showed formative effects. Treatments at stage (4) showed only limited translocation from the shoots and hardly any 2,4-D injury on the regrowth from stumps.—Univ. Calif., Davis.—*Weed Abstr.*, **14**, No. 212.

7444. KATAR'JAN, T. G., DROBOGLAV, M. A., AND DAVYDOVA, M. V.
The effect of gibberellin on vine yields. [Russian, with English, German and French summaries 6 lines each.] *Vestn. sel'sk. Nauki*, 1965, **10**(2): 85-92, bibl. 26, illus.

Spraying vine inflorescences with gibberellin solutions at 25–50 mg./l. at full bloom and at the beginning of berry growth resulted in higher and earlier yields of larger berries, especially in the seedless and Korinka černaja varieties. This effect was especially noticeable in seasons with adverse weather conditions at blossom time. [From authors' English summary.]

7445. DAVIDESCU, D., GEORGESCU, M., AND COSMIN, S.
Influenţa giberelinei asupra rodirii viţei de vie. **(The effect of gibberellin on vine yields.)** [English and French summaries ¾ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, 7: 175-90, bibl. 15, illus.

It is concluded that GA spraying should be confined to the inflorescence, that the concentration should be high and that varieties with hermaphrodite flowers, which show a negative response, should not be treated. Sprays of 200 mg./l., applied 1–2 weeks before flowering, increased the average grape weight, the fruit set and yield of varieties with functional female flowers and seedless varieties, and also increased the sugar content in the latter. [For earlier work see *H.A.*, 34: 6514.]

7446. (HALSEY, D.).
A good and a bad time to put gib on grapes. *West. Fruit Gr*, 1965, **19**(5): 29, illus.

Trials are reported in which gibberellin at 50 p.p.m. was applied to Thompson Seedless vines at early bloom, late bloom, the end of bloom shatter or 1 week later. The maximum increase in berry size was obtained by treatment at the end of bloom shatter. The refractometer readings were only slightly affected, a tight bunch was obtained and there was no effect on the proportion of shot berries. Early bloom applications increased the number of shot berries and resulted in a loose bunch. Late bloom applications resulted in a fair increase in berry size but a loose bunch. Applications the week after bloom shatter resulted in a good increase in berry size but markedly delayed maturity.

7447. JULLIARD, B., AND BALTHAZARD, J.
Effets physiologiques de l'acide gibbérellique sur quelques variétés de vigne (*Vitis vinifera* L.). **(The physiological effects of gibberellic acid on some varieties of *Vitis vinifera*.)** [English and German summaries ½ p. each.] *Ann. Amél. Plantes*, 1965, **15**: 61-78, bibl. 22, illus.

Aqueous solutions of 10, 20 and 50 p.p.m. GA were applied pre-blossom to the varieties Auxerrois, Pinot blanc, Pinot gris, Chasselas blanc, Gewurztraminer, Riesling and Sylvaner. The first 3 varieties named were the least affected. A general increase in shoot length was most marked in Sylvaner; the chlorophyll content of this variety decreased temporarily following treatment at the higher concentrations, and an increase was noted in leaf size and the weight of prunings. In January the dormancy of treated vines of Sylvaner was deeper than that of the controls, but this did not affect the time of bud burst in April. Treatment resulted in less compact inflorescences in Riesling, Chasselas, Sylvaner and Gewurztraminer. The pre-blossom treatment reduced the number of grapes per bunch and of seeds per berry. Post-blossom treatment induced the unfertilized berries to set parthenocarpically. Gibberellin sprays, however, inhibited flower initiation.—Stat. Rech. vitic. œnol., Colmar.

Vines—grape quality and composition.

(*See also* 7254, 7368, 7433, 7461.)

7448. HOLSTEIN-BECK, M. DE S. E.
Eficiência de um método de amostragem por bago em videiras. **(The efficiency of a method of sampling by taking single grapes from vines.)** [French and English summaries ¾ p. each.] *De Vinea Vino Portug. Docum., Sér. II*, 1964, **2**(1): 1-18, bibl. 13.

For studies on fruit ripening and the effects of various factors on it, 6 samples each comprising 50 grapes (1 grape from each vine) were taken from each of the varieties Tinta Miúda and Periquita. The results of determinations of berry volume, must volume, pH and density of the must, acidity, alkalinity and sugar content showed that this method of sampling was very reliable.

7449. HOLSTEIN-BECK, M. DE S. E.
Aspectos enológicos da maturação da uva. I. Considerações gerais. II. Ensaios de 1962. **(Grape ripening from the standpoint of wine production. I. General considerations. II. Experiments in 1962.)** [I. French summary ½ p. II. French and English summaries ½ p. each.] *De Vinea Vino Portug. Docum., Sér. II*, 1964, **1**(6): 1-32, bibl. 13; and **2**(2): 1-32, bibl. 13.

Part I reviews the effects of intrinsic and environmental factors on fruit ripening, the effects of harvesting date on the wine quality and yield, and the necessary determinations to be made in assessing fruit quality and factors affecting ripening. In part II these principles are applied to the varieties Vital Branco, Periquita and Tinta Miúda. Data are presented on fruit characteristics and must composition.

7450. RADLER, F.
The effect of temperature on the ripening of Sultana grapes. *Amer. J. Enol. Vitic.*, 1965, **16**: 38-41, bibl. 14.

The main effect of exposing Sultana vines to a constant temperature of 33° C. for 3 months, starting 20 days after flowering, was a reduction in berry size. Although the start of acid decrease and the start of sugar accumulation were not affected by the treatment, the rate of both processes was speeded up, resulting in a rise in the sugar/acid ratio.—C.S.I.R.O., Merbein, Vict.

7451. ALEHIN, K. K.
The effect of direct sunlight on sugar accumulation in vines. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(3): 35-7.

All the shoots of 2 vine varieties were exposed, by pruning and training, to 20, 25 and 47% and 26, 34 and 46% of direct sunlight, respectively. The berry sugar contents increased with increasing amounts of sunlight, and were highest on vines which bore only fruiting shoots. No relationship was found between the berry sugar contents and the number of bunches on the vine.

7452. KAIN, W., AND ARNDORFER, H.
Beitrag zum Nachweis roter Direktträgerweine. **(A contribution to the detection of direct-producer hybrid material in red wines.)** [English, French and Spanish summaries 6-7 lines each.] *Mitt. Klosterneuburg, Ser. A*, 1965, **15A**: 123-7, bibl. 9.

Two-dimensional paper chromatography showed the presence, in authentic red wines and others of unknown origin, of acylated anthocyanidin diglucosides. These substances would introduce considerable difficulties if rapid one-dimensional methods were used to detect malvidin diglucoside.—Landw.-chem. Bundesversuchsanst., Wien.

7453. ANON.
Contribución al estudio de la investigación de híbridos directos. Análisis cromatográfico de la materia colorante de las hojas. (2ª Comunicación.) **(A contribution to the study of the detection of direct-producer hybrids. Chromatographic analysis of leaf pigments. (2nd Communication.))** *Bol. Inst. nac. Invest. agron., Madrid*, 1964, **24**: 217-18.

Malvin was detected in the leaves of direct-producer hybrid vines only in autumn, when reddish pigments were evident, and never in spring or summer. In spite of this limitation of the application of the test, it remains of value for determining which vines in a mixed planting are responsible for the presence of malvin in the must. [For part 1 see *H.A.*, 34: 6487.]

7454. STĂNESCU, C.
Dinamica fierului în struguri, must şi vin la cîteva soiuri în diferite condiţii pedoclimatice pe anii 1958-1962. **(Iron metabolism in the grapes, must and wine of certain varieties grown under different soil and climatic conditions in the period 1958-1962.)** [French and Russian summaries 1 p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 241-8, bibl. 8.

Although the Fe content of grapes only amounted to 3–5 mg./l., in some wines the Fe content reached 30–60 mg./l. or even more, owing to contamination from external sources.

7455. Ribéreau-Gayon, P.
Les composés phénoliques du raisin et du vin. III.—Les tanins. **(The phenolic compounds of grapes and wine. III. The tannins.)** [English summary ½ p.] *Ann. Physiol. vég.*, 1964, **6**: 259-82, bibl. 159.

The condensed tannins in grapes and wine are derived from catechins and leucoanthocyanidins. The nature of the polymerization and its influence on the tannin properties are discussed, and work on the development of tannins during fruit ripening is reviewed. A table is presented of the phenolic compounds known to be present in grapes and wine and their content in red and white wines. [For part II see *H.A.*, 35: 5364. See also *H.A.*, 35: 668.]—Fac. Sci. Bordeaux.

7456. Rakcsányi, L.
A szőlőhéj cserzőanyagtartalmának kitermelése. **(Tannin production from grape skins.)** [English and Russian summaries ¾ p. each.] *Kert. szől. Föisk. Közlem.*, 1964, **28**(1, part 2): 265-81, bibl. 16; and *Kísérl. Közlem., Sect. C*, 1964 (issued 1965), **57C**(2): 15-34, bibl. 16.

Tannins can be extracted from both fresh and dried grape skins. With water extraction at 99° C., using the hide powder method, the extract comprised 25% tannins and 75% non-tannin materials. By starting extraction at 20–30° C. most of the non-tannins and only 20–30% of the tannins were dissolved. After this, extraction at 95–99° C. yielded an extract containing 60–65% tannins. From fermented marc smaller quantities of lower grade tannins were obtained.

7457. Luca, I., Tîrdea, C., and Mageru, V.
Radioactivitatea beta globală a unor vinuri din regiunea Iaşi. **(The total β-radioactivity of some musts in the Jassy region.)** [French and Russian summaries ¼ p. each.] *Lucr şti. Inst. agron. Iaşi*, 1964, pp. 203-9, bibl. 7.

The β-radioactivity of musts prepared in the autumn of 1963 from 14 vine varieties ranged between 1,721 and 2,610 pc./l. [10^{-12} curie/litre].

Vines—grape harvesting, storage and marketing.

7458. Yerington, A. P., and Spitler, G. H.
Careful picking gives better raisin quality. *West. Fruit Gr*, 1965, **19**(4): 32.

The rejection of any damaged or infected grape bunches during harvesting led to a great reduction in the amount of insect detritus in the dried raisins.—U.S.D.A. Stored-Prod. Insects Lab., Fresno, Calif.

7459. Díaz Massa, J.
Ligero estudio sobre uva de mesa en relación con su exportación. **(A general study on table grapes with reference to their export.)** *Bol. Inst. nac. Invest. agron., Madrid*, 1964, **24**: 239-86, illus.

Spanish and Italian production and export figures are compared. Bunch, berry and juice characteristics are described for 8 varieties of table grapes from various localities in Spain, and from the data are deduced criteria of suitability for storage and export.

7460. Dženeev, S. Ju.
Changes in the shipping quality of grapes during prolonged storage. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(2): 30-2.

Storage trials are reported on the fruit of 4 vine varieties from 2 regions in the Crimea. The shipping quality was measured at harvest time and at 15-day intervals during storage by noting the firmness, skin strength and degree of pedicel attachment. The varieties Asma and Šabam showed the best shipping qualities. Fruits produced in the southern coastal region of the Crimea remained firm for more than twice as long as those from the foothill regions.

7461. Dženeev, S. Ju.
Changes in the chemical composition of grapes during storage. [Russian.] *Vinodelie i Vinogradarstvo*, 1965, **25**(3): 20-2.

In studies over 3 years fruits of 3 vine varieties were stored at 0–2° C. and 85–90% R.H. for periods ranging from 30–180 days. During prolonged cold storage the berry sugar contents showed a slight increase and acidity decreased. Vitamin C, which was present in very small amounts in all 3 varieties, disappeared completely during storage. The contents of pectic substances varied from year to year, and declined rapidly soon after harvest. A considerable decrease in the berry sugar contents was observed in fruits stored at 6–10° C. [For earlier work see *H.A.*, 35: 3077.]

7462. Dobray, E., and Vas, K.
Kísérletek a csemegeszőlő tárolási idejének meghosszabítására különboző vegyszerek alkalmazásával. **(Experiments on extending the storage life of table grapes by means of various chemicals.)** [English and Russian summaries ½ p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 209-20, bibl. 11.

See *H.A.*, 35: 3078.

Temperate nuts.

(*See also* 7075, 7144, 7168.)

7463. Northern Nut Growers' Association.
55th Annual Report of the Northern Nut Growers' Association, 1964, Guelph, Ont., pp. 176, bibls, illus.

Papers read at this annual meeting deal with the following subjects: winter-hardy chestnuts; the propagation of chestnuts; irrigation of macadamias; the walnut bunch disease problem (probably a virus disease); grafting pecans; evaluation of F_1 pecan selections for resistance to the black pecan aphid (*Melanocallis caryaefoliae*); chemical weed control in nut plantings; growing nut trees under mulch; the saskatoon (*Amelanchier alnifolia*) as a fruit crop; the nutritional value of nuts; grading nuts; walnut culture and propagation; hardiness, pollination, selection and propagation of walnuts. A few of the papers have been abstracted separately in this number of *H.A.*

7464. Powell, J. V.
The domestic tree nut industries. An economic appraisal. *Agric. econ. Rep. U.S. Dep. Agric.* **62**, 1964, pp. 41, bibl. 2.

Almonds, filberts, pecans [see also *H.A.*, 34: 2480 and 35: 686] and walnuts.

7465. MEITH, H. C., AND PARSONS, P. S.
Nontillage and strip weed control cut almond production costs in Butte County tests. *Calif. Agric.*, 1965, **19**(6): 2-4, illus.

Production costs, including those for machinery and labour, are presented for an 80-acre almond orchard grown with a mown sward in the inter-rows and with herbicide treatment of the tree rows. This method of soil management could result in a saving of about $20/acre, compared with the conventional system of soil cultivation.—Univ. Calif., Davis.

7466. VELASCO, M., SCHONER, C., JR., AND LOFGREEN, G. P.
Composition and feeding value of almond hulls and hull-shell meal. *Calif. Agric.*, 1965, **19**(3): 12-14.

The physical and chemical characteristics of the hulls and shells of 6 almond varieties were investigated with regard to their value as animal feeding stuffs. Almond hull-shell mixtures contained no digestible protein. The source (dry or irrigated orchards) did not affect the composition of shells and hulls. More fleshy outer hull was present on soft-shelled than on hard-shelled varieties, and soft-shelled varieties contained less fibre and lignin. Hulls contained a high percentage of sugars and K; their usual moisture content was about 10% under air-dry conditions and their feeding value deteriorated with increased moisture.—Univ. Calif., Davis.

7467. JAYNES, R. A.
Grafting chestnuts without stock plants. *A.R. north. Nut Grs' Ass., 1964*, pp. 16-20, bibl. 1, illus.

A method of nurse seed grafting for sweet chestnuts is described in which dormant scion wood is grafted onto a recently germinated nut from which the hypocotyl and epicotyl have been removed. This is a modification of the technique described by Moore [see *H.A.*, 34: 6061]. The grafts are placed in a propagating frame to allow the scions to root. In trials with scions of 29 hybrids 38% survival of grafts was obtained. Successful grafts of oak on chestnut and oak on oak are also reported.—Conn. agric. Exp. Stat., New Haven.

7468. GUSEV, P. P.
The best varieties of filbert (*Corylus* spp.) for cultivation in the North Caucasus foothills. [Russian.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 136-43, illus.

Descriptions of 12 early varieties with an average yield of 2–8 kg. per bush, which were selected after 25 years of study.

7469. SEALE, A. D., JR.
Costs and returns for a pecan enterprise. *Bull. Miss. agric. Exp. Stat.* **686**, 1964, pp. 20, bibl. 1.

A fuller account of work abstracted in *H.A.*, 35: 687.

7470. STONE, D. E., ADROUNY, G. A., AND ADROUNY, S.
Morphological and chemical evidence on the hybrid nature of bitter pecan, *Carya* × *lecontei*. *Brittonia*, 1965, **17**: 97-106, bibl. 25, illus.

Morphological features and the fatty-acid composition of the kernel oils strongly suggest that *Carya illinoinensis* and *C. aquatica* were the original parents of *C.* × *lecontei*.—Duke Univ., Durham.

7471. MADDEN, G. D., AND STOREY, J. B.
Growth, temperature relations and callus formation of Mahan pecan scions under different methods of treatment. *A.R. north. Nut Grs' Ass., 1964*, pp. 48-9.

In trials on the treatment of inlay grafts on seedling pecan rootstocks the use of aluminium foil and a plastic bag round the graft increased the percentage take and reduced the amount of after-care needed because fewer shoots developed on the rootstock. Bark temperatures under grafting wax were higher than those under wax covered with whitewash or under aluminium foil covered with a plastic bag. The percentage take and subsequent scion growth were lower under the wax than with the other sealing treatments. Dipping the scions in β-NAA and/or IBA increased callus formation and the number of buds forced into growth on the scions, and resulted in a dwarfing of the shoots (caused by a shortening of the internodes); this dwarfing made the grafts more resistant to wind damage in the early stages of growth.—Tex. A. & M. Univ., College Station.

7472. COLE, J. R., AND HUNTER, J. H.
Abnormal flowering of pecans following freeze damage in 1955. *Plant Dis. Reptr*, 1965, **49**: 146-7, bibl. 1, illus.

The pecan is monoecious, and normally the staminate flowers are borne laterally on the previous year's wood and the pistillate flowers terminally in clusters on the current year's wood. After a frost in March, 1955, pistillate and staminate flowers were produced on the same raceme in several varieties, the pistillate flowers coming from lateral buds which would not normally have produced any flowers.—U.S. Dep. Agric., Albany, Ga.

7473. AKIMOČKIN, N. G.
Hybrid nuts (*Juglans* spp.) in the Forest-steppe Experimental Station. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 55, pp. 41-4.

A brief account is given of the performance of 11 hybrids of *Juglans sieboldiana*, *J. cinerea*, *J. mandshurica* and *J. nigra*. They all show hybrid vigour and are of ornamental and forestry value. [See also *H.A.*, 34: 6564.]

7474. ZATYKÓ, J., AND OTHERS.
A dió (*Juglans regia* L.) gyökérképződésére vonatkozó vizsgálatok. **(Investigations on root formation in walnuts.)** [English and Russian summaries 9 lines each.] *Kísérl. Közlem., Sect. C*, 1964 (issued 1965), **57C**(2): 35-42, bibl. 14.

When walnut cuttings were propagated by the splitting method [see *H.A.*, 29: 82 and 30: 1901] the protein-N content of the so-called tongues before rooting occurred was higher than that of similar tissues freshly cut from the controls. With the onset of rooting the difference gradually decreased. Root growth in *Tradescantia viridis* cuttings in the presence of walnut shoots showed a gradually increasing inhibition from January to August and a diminishing inhibition thereafter. This annual rhythm in the content of growth-inhibiting substances in walnut shoots could possibly be related to results of walnut grafting in the field, which are more successful in the spring than in July-August.

7475. ČERNÝ, L.
Veredelung der Walnuss und anderer Holzarten in der Zeit der echten Winterruhe. **(Grafting walnuts and other woody species during true dormancy.** [Czech and Russian summaries ¼ p. each.] *Biol. Plant., Prague*, 1965, **7**: 226-37, bibl. 18, illus.

Experiments showed that an injury to the shoot of a woody species during true dormancy induces, under favourable conditions, a renewal of cell division in the meristematic tissue in the neighbourhood of the wound, although the cambial cells at a distance of a few mm. from the site of the wound and the intact tissue of the shoot and its buds remain dormant. If grafting takes place during dormancy the components unite, especially under suitable conditions of temperature and moisture, without bud development on the scion or rootstock. The practicability of this method of grafting walnuts and vines has been established.—Inst. exp. Bot., Prague.

7476. Belostokov, G. P.
The structure of the conducting system in seedlings of *Juglans mandshurica*. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 55, pp. 94-9, bibl. 11, illus.

Differentiation and development of conducting tissues.

7477. Mazur, O. P., and Šemahanova, N. M.
The effect of forest soil on the development of one-year-old walnut seedlings. [Russian, with English summary ½ p.] *Izv. Akad. Nauk SSSR, Ser. biol.*, 1965, No. 3, pp. 428-31, bibl. 4.

In Tadžikistan endotrophic mycorrhiza were noted on the roots of walnuts. The application of walnut-forest soil to the planting furrow stimulated walnut emergence and mycorrhiza development, and increased the height, stem diameter, leaf number, root length and dry weight of 1-year-old seedlings. The presence of forest soil had a favourable effect on the recovery of seedlings that had been severely damaged by hail.

PLANT PROTECTION OF TEMPERATE FRUITS.

General.

(*See also* 7069.)

7478. Ontario Department of Agriculture.
1965 Spray calendar for apples, cherries, peaches, pears, plums and small fruits. *Publ. Ont. Dep. Agric.* **360**, 1965, pp. 25.

Recommendations for the application of fungicides, insecticides, herbicides, nutrients, chemicals to control and accelerate fruit thinning, and baits and repellents for animal pests.

7479. Cole, H.
Control diseases of raspberries and other brambles. *Circ. Pa St. Univ. Ext. Serv.* **523**, [1965], pp. 24, illus.

Symptoms and control of virus, fungal and bacterial diseases.

Disorders of uncertain or complex origin.

(*See also* 7194, 7251, 7274, 7285-7290, 7463.)

7480. Melville, F., and others.
Apple dieback in Western Australia. *J. Agric. W. Aust.*, 1965, **6**: 82-8, bibl. 2, illus.; and *Fruit World, Melbourne*, 1965, **66**(3): 12, 14, 16, bibl. 2.

The symptoms of this disorder, which is caused by the hot, dry summer conditions of Western Australia, include a failure of the leaders to continue growth, papery bark and a secondary invasion of affected limbs by wood-rotting fungi. Field observations and trials indicated that it could be minimized or avoided by thinning sprays to regulate cropping, summer irrigation, light pruning and the avoidance of root injury during cultivation.

7481. Majernik, O., Erdel'ska, O., and Frič, F.
A study on the causes of premature death in apricots (*Prunus armeniaca*). [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 55, pp. 69-71, bibl. 16.

Possible pathological and physiological causes are discussed. [See also *H.A.*, 34: 589 and 35: 701.]

7482. Powell, W. M., Owen, J. H., and Campbell, W. A.
Association of phycomycetous fungi with peach tree decline in Georgia. *Plant Dis. Reptr*, 1965, **49**: 279, bibl. 4.

A survey showed that peach tree decline was associated with excessive rainfall in late winter, waterlogged soil at flowering time and diseased feeder roots. Several species of *Pythium* and *Phytophthora* were isolated in autumn and early winter from the soil around both affected and apparently healthy trees, and also from the soil around peach seedlings stored in the packing shed. An association is postulated between decline and root damage by these species of water-mould under conditions of excessive soil moisture.—Univ. Ga, Athens.

7483. Claus, P.
Untersuchungen zur Stiellähme 1963 und 1964. **(Investigations on grape stalk withering in 1963 and 1964.)** [French and English summaries 7 lines each.] *Weinberg u. Keller*, 1965, **12**: 101-10, bibl. 8, illus.

Analysis of the grape stalks at harvest time showed no relationship between nutrient content and withering.

Viruses.

(*See also* 7304, 7571.)

7484. Boxus, P.
Quelques observations sur les maladies à virus des arbres fruitiers en Belgique. I. Données générales et viroses du pommier. II. Viroses du poirier, du cerisier et du prunier. III. Moyens de lutte et conclusions. **(Some observations on the virus diseases of fruit trees in Belgium. I. General information and virus diseases of apples. II. Virus diseases of pears, cherries and plums. III. Methods of control and conclusions.)** *Fruit belge*, 1965, **33**: 71-6, 91-8, 137-9, bibl. 3, illus.

7485. Johnstone, G. R.
Virus diseases of deciduous fruit trees. *J. Aust. Inst. agric. Sci.*, 1965, **31**: 36-9, bibl. 3.

Including a list of indicators considered suitable for the detection of virus diseases of pome and stone fruits in Australia.

7486. Groves, A. B.
Response of *Malus* species and varieties as potential indicators to latent pome virus cultures. Abstr. in *Phytopathology*, 1965, **55**: 504.

Five latent virus cultures from apple were selected for testing across many *Malus* species for differential responses. The cultures selected had responded in earlier tests as follows: (1) positive on all indicators used; (2) negative on all indicators used; (3) positive for Spy lethal virus (SLV) only; (4) positive for chlorotic leaf spot virus (CLSV) only; and (5) positive for both SLV and CLSV. Except for the first culture, it was not known whether other viruses might be present. Greenhouse-grown juvenile apple seedlings were used as bud carriers. Tests were made on 30 potential indicators, and results have been read on 23. Results suggest that responses are limited to CLSV and SLV, although possible woody symptoms have not yet been read. None of the indicators tested has responded where both Russian 12740-7A and Spy 227 were negative. Some responded to both viruses, others to one only. Some were more sensitive to CLSV than was R-12740-7A and a few were hypersensitive. Spy 227 has proved a consistent indicator for SLV, but also gives a distinctive symptomatic response to CLSV in mixed cultures. These potential indicators are probably useful only for the detection of CLSV or SLV.—Va agric. Exp. Stat., Fruit Res. Lab., Winchester.

7487. LISTER, R. M., BANCROFT, J. B., AND NADAKAVUKAREN, J.
Characteristics of filamentous viruses isolated mechanically from apple. From abstr. in *Phytopathology*, 1964, **54**: 899.

Viruses of 2 types, isolated from flowers and leaves of apple trees containing "latent viruses", were shown to be unrelated.—Purdue Univ., Lafayette, Ind.

7488. POSNETTE, A. F., AND CROPLEY, R.
The growth of apple trees with and without latent virus infection. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 150-1, bibl. 3.

A virus complex (chlorotic leaf spot, Spy 227 decline and Virginia Crab stem-pitting) had only slight effects on the growth of 2 scion varieties, each on 2 clonal rootstocks. The infection reduced the size of Bramley's Seedling trees on MM.104 during the first year, but the difference was negligible in the second year; infected and virus-free trees grew equally well on MM.111. Infected trees of an unnamed variety, W.10, on M.26 made more growth than virus-free trees; on MM.104 virus-free trees did not differ significantly from infected ones. This high degree of tolerance probably reflects a long period of unconcious selection. [Authors' abstract.]

7489. MCCRUM, R. C.
Detection of common antigens of apple virus isolates by complement fixation. From abstr. in *Phytopathology*, 1964, **54**: 900.

Rabbit antiserum to dapple apple virus was obtained with apple leaf tissue as an antigen source. Complement-fixation tests demonstrated activity of the dapple apple antiserum to the homologous antigen source. Test antigens from russet-ring and green-mottle apple virus isolates also reacted with dapple apple antiserum, which suggests common etiology. Some trace activity to healthy apple-leaf antigens occurred at low antigen dilutions. No activity occurred with normal rabbit serum.—Univ. Me, Orono, and Univ. N.H., Durham.

7490. MONSELISE, S. P.
Some reactions of apple and cherry leaves to virus diseases. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 133-9, bibl. 22.

The effects upon the enzyme systems peroxidase and catalase were studied of infection of Cox's Orange Pippin and Lord Lambourne apples with rubbery wood virus (RW), alone or with apple mosaic (RW+AM), and of Bing cherry with prune dwarf virus (PDV), raspberry ringspot virus (RRSV), or both together. In the apples RW had little effect, but RW+AM increased peroxidase and reduced catalase activity. In the cherry PDV+RRSV increased the activity of both enzymes. The dry matter content of the leaves and its accumulation during the day were investigated in the 2 apple varieties; only certain differences were statistically significant, RW Cox leaves being heavier per unit area than the controls, and RW+AM Lambourne leaves being lighter. Leaf area was also affected: RW in Cox reduced leaf size, and PDV alone or in combination with RRSV greatly reduced cherry leaf area, apparently after cell division had ceased. [From author's abstract.]

7491. AGRIOS, G. N.
Fruit russet ring and leaf flecking virus on McIntosh apple in Massachusetts. *Plant Dis. Reptr*, 1965, **49**: 314-18, bibl. 5, illus.

Symptoms are described for the fruit and foliage of affected trees. No natural spread of the disease was observed.

7492. BAUMANN, G., AND LEMMICH, H.
Das Stammnarben-Virus (stem pitting) des Apfels in Deutschland. (**Apple stem-pitting virus in Germany.**) *ErwObstb.*, 1965, **7**: 123-6, bibl. 10, illus.

Transmission tests with Virginia Crab showed that all the important apple varieties in Germany are infected with stem-pitting virus. The injuries which the virus produces in the xylem and phloem may lead to symptoms of incompatibility between scion varieties and the stem-builders Virginia Crab and Maunzen. In view of the wide distribution of the virus the use of susceptible stem-builders is inadvisable.—Inst. Obstb., Bonn.

7493. HILKENBÄUMER, F., AND BAUMANN, G.
Zur wirtschaftlichen Bedeutung der Birnenvirosen Ringfleckenmosaik und Adernvergilbung. (**The economic importance of the pear ring pattern mosaic and vein yellows viruses.**) *ErwObstb.*, 1965, **7**: 45-8, bibl. 18.

Diagnosis of the diseases and their economic importance are discussed. Tabulated data are presented on the extent of infection in 13 varieties, and on the effect of the viruses on the growth of 2-year-old grafted trees of Gellerts Butterbirne.

7494. MINK, G. I., AND PARSONS, J. L.
The prevalence of some latent viruses in sweet cherry trees of various age groups in orchards in south central Washington. *Plant Dis. Reptr*, 1965, **49**: 143-5, bibl. 9.

The incidence of necrotic ringspot virus or sour cherry yellows virus or both in sweet cherry orchards as determined by Shiro-fugen indexing tests was 93% infection in trees over 20 years old, 65% in trees 5 to 10 years old, and 65% in trees 1 to 4 years old. The incidence of green ring mottle in the same trees was 88, 54 and 54%, respectively. A virus causing gummosis of Tilton apricot was found in one or more symptomless sweet cherry trees in 10 out of 14 orchards surveyed. The virus was found in trees of all age groups. [Authors' abstract.]—Irrig. Exp. Stat., Prosser, Wash.

7495. Kegler, H.
Untersuchungen über Ringfleckenkrankheiten der Kirsche. I. Symptomatologie. (**Investigations on ringspot diseases of cherry. I. Symptomatology.**) [English summary ⅓ p.] *Phytopath. Z.*, 1965, **53**: 174-89, bibl. 30, illus.

Symptoms of the Stecklenberg disease and yellows of sour cherry and the necrotic and chlorotic ringspots of sweet cherry are discussed.

7496. Fridlund, P. R.
Symptoms of necrotic ringspot and prune dwarf in several *Prunus* species. *Plant Dis. Reptr*, 1965, **49**: 288-92, bibl. 13.

Shock symptoms are described for Montmorency sour cherry, Bing cherry and *Prunus tomentosa*. Sour cherry yellows symptoms were caused by the prune dwarf virus alone or in conjunction with the necrotic ringspot virus, and were more severe for the combined infection. [For related work see *H.A.*, 35: 3116.]—Irrig. Exp. Stat., Prosser, Wash.

7497. Tremaine, J. H., Allen, W. R., and Willison, R. S.
Serological detection and differentiation of prune dwarf and necrotic ringspot viruses in *Prunus* tissue extracts. *Phytopathology*, 1964, **54**: 995-8, bibl. 14.

The 2 *Prunus* viruses were partially purified from petals of 4 different sour cherry trees with yellows symptoms. These viruses were shown by the gel diffusion technique to be serologically unrelated and could be detected simultaneously in each of the petal preparations. The viruses in each preparation were separated by means of differential herbaceous hosts. [From authors' abstract.] —Canada Dep. Agric., Vineland Stat., Ont.

7498. Tiits, A.
Viiruslikest ja mitteviiruslikest vaarikalehtede laigustustest Eestis. (**Viral and non-viral mottling on raspberries in Estonia.**) [English and Russian summaries ¼ p. each.] *Izv. Akad. Nauk Est. SSR, Ser. biol.*, 1965, **14**: 130-4, bibl. 12.

Studies on the origin of virus-like mottle symptoms on raspberry leaves revealed 3 causes. Virus infection caused only vein chlorosis, whereas vein-banding was produced by unfavourable growing conditions, and multicoloured spots on wild raspberries were caused by the raspberry leaf mite (*Eriophyes gracilis*).

7499. Pomazkov, Ju., and Jaroslavclev, E.
Virus diseases of raspberries. [Russian.] *Sadovodstvo*, 1965, No. 3, pp. 36-7, illus.

Symptoms are described of raspberry dwarfing, leaf curl, vein chlorosis and mosaic virus diseases. Recommendations for the control of virus vectors include periodic treatment of the plantation before flowering with 0·1% parathion or Metasystox.

7500. Freeman, J. A., and Stace-Smith, R.
Systemic invasion of the root system of raspberry plants by the component viruses of red raspberry mosaic. *Canad. J. Plant Sci.*, 1965, **45**: 296-7, bibl. 3.

Healthy clones of 4 raspberry varieties were grafted in July-August with material infected either with black raspberry necrosis virus (BRN) or with both BRN and rubus yellow net virus. The following February root cuttings were taken and the plants produced from these were examined visually for infection. In plants of the variety Fairview infected with the 2 viruses BRN virus moved at a faster rate than rubus yellow net virus, so that some plants showed only a mottling of the foliage instead of the characteristic mosaic caused by the combination of viruses. From the incomplete invasion by virus of the roots of August-grafted plants, it appeared that virus movement was negligible during the dormant period October-February.—Canada Dep. Agric., Agrassiz and Vancouver, B.C.

7501. Ministry of Agriculture, London.
Virus diseases of strawberry. *Adv. Leafl. Minist. Agric., Lond.*, **530**, 1964, pp. 6, illus.

Viruses transmitted by aphids, leafhoppers and nematodes, varietal reactions, certification schemes and the control of vectors.

7502. Way, D. W.
Further observations on the field performance of heat-treated strawberry clones. *J. hort. Sci.*, 1965, **40**: 167-74, bibl. 4.

The growth and cropping of 2 virus-infected strawberry varieties were compared with those of clones the virus content of which had been reduced by heat therapy. The heat-treated clones of both Cambridge Favourite and Early Cambridge were considerably more vigorous, bearing more crowns than their untreated counterparts. In the first year after planting, both clones of each variety produced similar total yields, but the heat-treated clones produced a higher percentage of large fruit. Plants of the heat-treated clone of Cambridge Favourite flowered and ripened their fruit later than plants of the untreated clone in the second year, but gave a greater yield. However, the 2 clones of Early Cambridge gave similar yields, the increased potential of the heat-treated clone provided by a greater number of crowns being offset by reduced inflorescence formation. In order to establish whether reduction of vigour would lessen the tendency of some heat-treated clones to form barren crowns, spring planting was compared with autumn planting. Spring planting, which reduced plant size and yield of both varieties in the first season but had less effect on size and none on yield in the second season, failed to check partial barrenness in the heat-treated clone of Early Cambridge. At the end of the first growing season the heat-treated clones of both varieties showed a greater incidence of *Verticillium* wilt than the untreated clones, but this difference was not maintained in the second year. [Author's summary. For earlier work see *H.A.*, 28: 2337.]—East Malling Res. Stat., Kent.

7503. Pieniazek, S. A.
Virus-free strawberries increase Polish production ten fold. *Grower*, 1965, **63**: 1245, illus.

Virus-free varieties introduced to Poland and grown next to infected stock for 5–10 years have remained healthy, probably owing to the absence of aphid vectors. Plantations are cropped for up to 10 years, and are mostly on podsolic sandy soils. The yields of 2-year-old Senga Sengana and Talisman plants grown on unfertilized podsolic soil which had received no FYM for 42 years were 5·6 and 4 tons per acre, respectively. Applications of K resulted in a significant increase in yields, but N and P had no effect.

7504. Miller, P. W., and Jensen, H. J.
Non-transmission of certain strawberry viruses by nematodes. *Plant Dis. Reptr*, 1965, **49**: 509-11, bibl. 7.

The strawberry viruses latent A, latent C, crinkle, mild yellow-edge and witches' broom were not transmitted in the laboratory by Oregon populations of *Longidorus elongatus*, *Trichodorus allius* or *Xiphinema bakeri*. A Californian strain of peach yellow bud mosaic virus in strawberries was not transmitted by either *L. elongatus* or *X. bakeri.*—Ore. agric. Exp. Stat., Corvallis.

7505. Canova, A., and Tacconi, R.
Ricerche sui virus della fragola. II. Un virus trasmissibile per succo. **(Studies on strawberry viruses. II. A sap-transmissible virus.)** [English and French summaries ½ p. each.] *Phytopath. medit.*, 1965, **4**: 31-7, bibl. 14, illus.

The virus was found to be soil-borne and was not transmissible by strawberry aphids (*Pentatrichopus fragaefolii*). Its thermal inactivation point was between 60° and 70° C., and it persisted for more than 3 months in withered tissue at −22° C. It produced symptoms on bean plants, but not on *Chenopodium amaranticolor* or tobacco.—Univ. Studi, Bologna.

7506. Krczal, H.
Das Arabis-Mosaik-Virus, ein gefährlicher Krankheitserreger der Kulturerdbeere. **(Arabis mosaic virus, a dangerous pathogen of strawberries.)** *ErwObstb.*, 1965, **7**: 121-3, bibl. 22, illus.

Includes advice on prevention of infection by the use of healthy planting material, weed control to keep the beds free of alternative hosts and control of the vector, *Xiphinema diversicaudatum*.

7507. Miller, P. W.
Rapid spread of mottle and mild yellow-edge viruses into hybrid strawberry selections. *Plant Dis. Reptr*, 1965, **49**: 284.

During a routine virus indexing test more than 50% of strawberry breeding selections were found to be infected, despite regular spraying with demeton. Mottle and mild yellow-edge viruses were the most prevalent, and crinkle and a complex of mild yellow-edge+mottle were present in a few plants.—U.S.D.A., Corvallis, Ore.

7508. Carver, R. G., Horn, N. L., and Boudreaux, H. B.
***Macrosiphum rosae, Acyrthosiphon porosum,* and *Aphis gossypii* as vectors of strawberry viruses in Louisiana.** *Plant Dis. Reptr*, 1965, **49**: 495-9, bibl. 7.

Aphis gossypii and *Acyrthosiphon porosum* transmitted mottle virus and *Macrosiphum rosae* transmitted vein-banding virus in transmission studies.—McNeese St. Coll., Lake Charles, La, and La St. Univ., Baton Rouge.

7509. Bolton, A. T.
Virus-free strawberries and raspberries in Eastern Canada. *Res. for Fmrs, Canada*, 1965, **10**(2): 14-16, illus.

Subjecting plants infected with the strawberry mottle virus to a temperature of 100° F. for a period of 7 to 10 days destroyed the virus. Veinbanding and latent C viruses were inactivated in the strawberry variety Valentine by subjecting them to a temperature of 108°-115° F. for 10 days. Virus-free plants of the Latham raspberry have been obtained by growing infected plants at 98° F. for 75 days and propagating the treated plants by tip cuttings under mist.—Canada Dep. Agric., cent. Exp. Fm, Ottawa.

7510. Caudwell, A.
Identification d'une nouvelle maladie à virus de la vigne, "la flavescence dorée". Étude des phénomènes de localisation des symptômes et de rétablissement. **(Identification of flavescence dorée, a new virus disease of vines. A study of the phenomena of localization of symptoms and recovery.)** [English summary 1 p.] *Ann. Épiphyt.*, 1964, **15**, Hors-série 1, pp. 193, bibl. 116, illus., F. 25.
Le rétablissement et la localisation de symptômes chez la flavescence dorée. **(The recovery from, and the localization of symptoms of, flavescence dorée.)** *Phytiat.-Phytopharm., Paris*, 1964, **13**: 133-6, bibl. 4.

In the first paper a detailed report is given of an extensive 8-year study of the symptoms, epidemiology and behaviour of flavescence dorée [see also *H.A.*, 32: 4062, 4603; 33: 6982; 35: 3132]. This virus disease is exceptional in that the symptoms are frequently localized and the plants can recover but still be subject to a relapse. In south-west France, where the disease is epidemic, the symptoms of a primary infection are always severe. In the second and succeeding years the vines will either appear healthy or show only localized symptoms, symptom development being apparently fortuitous. On grafts and cuttings taken from infected vines symptoms develop only if the wood was taken from a part of the vine affected in the previous year, and then only if there is sufficient sunshine; the symptoms generally last for only one year, and after the dormant period recovery is complete. The reappearance of the disease in recovered vines was shown to be due to reinoculation by the leafhopper vector. When the virus attacks a vine that has been previously affected with either flavescence dorée or court-noué, the symptoms are always localized. It is postulated that a new type of defence reaction is operative; this reaction is not specific, is proportional to the symptom severity of the infection that produces it, and persists after the apparent disappearance of the infective agent. In east-central France the virus is endemic and behaves differently, the symptoms remaining constant year after year on the same vines. A different strain of the virus may be involved here, from which the vines are less able to recover. The second paper is a brief summary of the same work.—Stat. Path. vég., Pont-de-la-Maye, Gironde.

7511. Salerno, M.
Effetti di somministrazioni di boro in viti apparentemente sane e con sintomi di degenerazione infettiva nella zona etnea. **(The effects of boron application on apparently healthy vines and those showing symptoms of infectious degeneration in the Etna region.)** *Tecn. agric.*, 1963, **15**: 117-25, bibl. 11, [received 1965].

See *H.A.*, 33: 6985.

7512. Stellmach, G.
Über die Infektiosität eines Weinbergsbodens. Isolierung des Tomatenschwarzringflecken-Virus mit Hilfe von Köder-Pflanzen. **(The infectivity of a vineyard soil. The isolation of tomato black ringspot virus with the aid of test plants.)** *Weinberg u. Keller*, 1965, **12**: 74-6, bibl. 5.

The virus was transmitted through the soil from infected vines to the roots of a cucumber seedling (test plant) and to a young healthy vine subsequently grown in the same soil.—Inst. Rebenkrankh., Bernkastel-Kues.

Bacteria.

(*See also* 7141.)

7513. GOODMAN, R. N.

The influence of avirulent forms of *Erwinia amylovora* and saprophytic species on the virulence of *E. amylovora in vivo.* Abstr. in *Phytopathology*, 1964, **54**: 894.

An avirulent yellow bacterium "closely related" to *E. amylovora* suppressed the growth of virulent isolates of *E. amylovora in vitro.* When these 2 species were mixed and inoculated into host tissue, virulence of the bone fide *E. amylovora* was reduced. The longer the 2 species were permitted to incubate together prior to inoculation (0–48 hours), the more drastically virulence was curtailed. Jonathan apple shoots inoculated midway between the first node and the apex with yellow bacterium 1 hour prior to inoculation in the same position with a virulent *E. amylovora* isolate failed to develop typical symptoms of the disease. In subsequent analogous experiments, in which the shoots were initially inoculated with *Bacillus subtilis*, *B. cereus*, *Xanthomonas pruni*, an avirulent strain of *E. amylovora* or the yellow bacterium, disease symptoms failed to appear only in those shoots which were initially inoculated with the avirulent *E. amylovora* isolate or the yellow bacterium.—Univ. Mo., Columbia.

7514. LEWIS, S., AND GOODMAN, R. N.

Mode of penetration and movement of fire blight bacteria in apple leaf and stem tissue. *Phytopathology*, 1965, **55**: 719-23, bibl. 41.

Six series of experiments were made on 1-year-old Jonathan apple trees in the greenhouse to study the etiology of the twig blight phase of fire blight (*Erwinia amylovora*). The results established that the fire blight pathogen can enter through natural openings in the upper surface of the leaf (which lacks stomata) and through lenticels of the stem. The foliar trichomes, hydathodes and lenticels may serve as natural portals of infection, and wounding is not a pre-requisite for infection. Once the pathogen enters the leaf, migration in the leaf and stem is rapid, and movement in the stem occurs *via* the phloem. Succulence favours the rapid progress of the disease, but it is not deemed essential for infection. Wounding appears to favour susceptibility, and increased concentration of vacuolar sap does not favour resistance to infection. [From author's abstract. See also *H.A.*, 35: 3136.]—Univ. Mo., Columbia.

7515. DEVAY, J. E., AND OTHERS.

Frequency of crown gall- and bacterial canker-resistant seedlings from seed of *Prunus* rootstocks irradiated with thermal neutrons. From abstr. in *Phytopathology*, 1964, **54**: 891.

Seeds of *Prunus persica* (Lovell peach), *P. amygdalus* (bitter almond), *P. mahaleb* (cherry) and *P. cerasifera* (myrobalan plum), currently used for rootstocks, were irradiated with 12 dosages of X-rays or thermal neutrons within their pits before stratification. Based on percentage emergence and seedling growth after irradiation, neutron treatments were chosen for further experiments on disease resistance. From 3,000 seeds of each *Prunus* species high resistance or immunity to crown gall (*Agrobacterium tumefaciens*) and bacterial canker (*Pseudomonas syringae*) was found singly or combined in seedling plants. The frequency of crown gall-resistant plants was 2·0–8·3% higher in irradiated populations of almond, peach and plum, but 6·9% lower in cherry, in comparison with the non-irradiated controls. In contrast, the frequency of bacterial canker-resistant plants was 2·1–22·4% lower in irradiated populations of almond, peach and plum, but 14·6% higher in cherry. Resistant seedlings were screened in 5 consecutive tests and, except for almonds, 10 cuttings from selected seedlings of each species were rooted and retested to verify their disease resistance. As the resistant plants aged, a slight increase in susceptibility of some plants to crown gall was observed.—Univ. Calif., Davis.

7516. MILLIKAN, D. F., GUENGERICH, H. W., AND GOODMAN, R. N.

Gummosis and leaf spotting of sweet cherry, symptoms associated with bacterial infection. *Plant Dis. Reptr*, 1965, **49**: 380-1, bibl. 3.

A disease syndrome similar to that incited by the necrotic rusty mottle virus occasionally occurs on several varieties of sweet cherry under midwestern conditions. Trees showing these symptoms proved negative for necrotic rusty mottle when indexed on the sensitive variety Lambert. Bacteria [including *Pseudomonas* sp. and *Xanthomonas* sp.] were associated with the gumming or leaf spotting phase, and reproduced these symptoms when introduced into healthy trees. Copper sprays applied to the infected trees late in the autumn before leaf fall eliminated the symptoms during the subsequent season. [From authors' abstract.]—Univ. Mo., Columbia.

7517. DE VRIES, D. P.

Field resistance to bacterial canker in some cherry seedling populations. *Euphytica*, 1965, **14**: 78-82, bibl. 12.

In 9–13-year-old cherry seedling populations totalling 1,033 individuals a preliminary selection was made in 1963 for field resistance to bacterial canker (*Pseudomonas syringae*). The field resistance of the 3 cherry species used, *P. avium*, *P. cerasus* and *P. avium* × *P. cerasus*, was shown to be low, high and very high, respectively. [Author's abstract. See also *H.A.*, 35: 3143.]—Inst. hort. Plant Breed., Wageningen.

7518. DOWLER, W. M., AND PETERSEN, D. H.

Transmission of *Pseudomonas syringae* in peach trees by bud propagation. From abstr. in *Phytopathology*, 1964, **54**: 891.

The widespread nature of bacterial canker (*Pseudomonas syringae*) in certain peach orchards has indicated the possible transmission of the bacteria by bud propagation. To determine the significance of this transmission, buds from a 3-year-old peach orchard (cv. Redcrest) heavily infected with bacterial canker were budded to seedlings in June, 1962. In the spring of 1963 approximately 600 of these trees were set in each of 2 blocks, together with commercially procured Sunhigh trees which served as the controls. By the end of the first year 28% of the Redcrest trees had died, compared with 17% of the Sunhigh trees. This difference, presumably due to bacterial canker, was significant at the 1% level. Fluorescent bacteria morphologically similar to *P. syringae* were isolated readily from buds and twigs of the Redcrest block, but rarely from the Sunhigh trees. —U.S.D.A., Clemson, S.C.

7519. Keil, H. L., Smale, B. C., and Wilson, R. A. **Control of peach bacterial leaf spot with sprays of oxytetracycline plus dimethyl sulfoxide.** Abstr. in *Phytopathology*, 1965, **55**: 505.

Bacterial leaf spot, *Xanthomonas pruni*, was controlled on Sunhigh peach seedlings by a protective spray of oxytetracycline (agricultural-grade antibiotic) in replicated greenhouse tests. The protective properties of the antibiotic at 42 p.p.m. were significantly enhanced by the inclusion of 0·25–2%, but not 0·1%, dimethyl sulphoxide (DMSO) in the spray mixture. Significant enhancement of control was also obtained with 28 p.p.m. of antibiotic combined with 1–2%, but not with lower concentrations, of DMSO. Sprays containing DMSO alone were ineffective. Dodine and zinc sulphate were ineffective both alone and in combination with DMSO under the severe disease conditions of these tests. Residues resulting from a DMSO-oxytetracycline spray provided some foliage protection for as long as 8–10 days. Less disease also occurred on inoculated terminal leaves that developed after the spray was applied. These results suggest absorption of the spray mixture by old leaves and subsequent translocation into newly developing leaves. Eradication of *X. pruni* occurred only if treatment was applied within 24 hours after inoculation.—U.S.D.A., Beltsville, Md.

Fungi.

(*See also* 7304, 7325-7327, 7502, 7574.)

7520. Brook, P. J., and Bailey, F. L. **Control of European canker.** *Orchard. N.Z.*, 1965, **38**: 117-18, illus.

Bordeaux mixture at 10 : 8 : 100 and phenylmercuric chloride at 4 lb. of 2·5% w.p. per 100 gal. were compared during 3 successive years for the control of *Nectria galligena* in a heavily infected apple orchard. Four applications were made, viz. at the beginning and the end of leaf fall, immediately before pruning, and at the green-tip stage. Both fungicides gave good control, the infection being negligible by the third year; bordeaux proved slightly more effective than PMC.

7521. Mitterling, L. A. **Susceptibility of various apple clonal rootstocks to cedar apple rust.** *Plant Dis. Reptr*, 1965, **49**: 578-80, bibl. 8.

Twelve apple clonal rootstock varieties were compared for their susceptibility to cedar apple rust, *Gymnosporangium juniperi-virginianae*. As with scion varieties, a gradation of susceptibility was indicated, but none of the rootstocks studied showed such complete resistance to the disease as that shown by the scion variety Baldwin. Rust lesions were present on leaves of the rootstock variety M.II but no aecia were present. Of the 4 Malling-Merton clones in use commercially only MM.111 showed resistance. [From author's abstract.] —Univ. Conn., Storrs.

7522. Mezzetti, A., and Marubini, E. Il marciume lenticellare delle mele da *Gloeosporium*. II. Biologia. B. Influenza del congelamento dei frutti sulla durata del periodo di incubazione del marciume. (Prova preliminare). **(*Gloeosporium* lenticel rot of apples. II. Biology. B. The effect of freezing the fruit on the duration of the incubation period of the rot. (Preliminary test.))** *Riv. Ortoflorofruttic. ital.*, 1965, **49**: 220-36, bibl. 16, illus.

The reduction of the *Gloeosporium* incubation time in artificially inoculated apples of the variety Abbondanza was greater after their exposure to −3° C. for 5½ days than after 20 hours' exposure to −6° C. Tentative conclusions on the relationship of incubation time to temperature are compared with those of Pierson [see *H.A.*, 19: 1268]. [For part I.D. see *H.A.*, 34: 2531.]—Univ. Milano.

7523. Kozickij. Ju. **Monilial scald of apples.** [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(3): 36-7.

Good control of grey rot (*Monilia cinerea* f. *mali*) was obtained by spraying twice between bud-break and flowering with 0·3% dichlone, 1% ziram, 0·5% captan or 0·5% Phaltan. Spring applications of 3–4% bordeaux mixture were only half as effective.

7524. Díaz Moreno, J. Control químico del oidio del manzano. **(Chemical control of apple mildew.)** [English summary ¼ p.] *Cienc. y Natur.*, 1964, 7: 58-62, bibl. 2, illus.

Karathane at 0·5, 0·75 and 1·0 lb. per 100 l. and wettable sulphur at 5·0, 7·5 and 10·0 lb. were compared in a trial on Emilia apples in Ecuador in 1961-62. Five sprays were applied at late dormancy, bud-swell, bud-burst, petal-fall and the fruitlet stage. There were no significant differences between the results, but the 0·75 lb. Karathane was considered the most promising treatment on the basis of the number of buds infected with *Podosphaera leucotricha*. It is recommended that the spray should not be applied during blossoming or in strong sunlight.

7525. Kobahidze, D. **Apple mildew.** [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(3): 18-19, illus.

In combined fungicide and pruning trials for the control of *Podosphaera leucotricha*, the best results were obtained by pruning out infected shoots in the autumn and spring and spraying after flowering with 0·1% Karathane.

7526. Molnár, J. Účinnosť niektorých čs. vývojových fungicídov proti múčnatke jabloňovej (*Podosphaera leucotricha* (Ell. et Ev.) Salm.) v porovnaní so zahraničnými prípravkami. **(The effectiveness of some experimental fungicides made in Czechoslovakia for the control of apple mildew in comparison with foreign preparations.)** [English and Russian summaries ½ p. each.] *Pol'nohospodárstvo*, 1965, **11**: 172-81, bibl. 22, illus.

For mildew control on Jonathan apples 9 post-blossom applications of the new Czechoslovak products based on captan+S and phaltan+S were compared with 0·5% colloidal sulphur, 0·5% Thiovit (wettable sulphur) and 0·1% Karathane. The most effective fungicide was Thiovit, giving 88·31% control, and the least effective was phaltan+S, giving 69·85% control. The other 3 materials did not differ significantly from each other and gave almost 80% control. In another trial with Ribston Pippin 0·1% Karathane and 0·3% Wepsyn 155 gave 84·07 and 83·33% control, respectively. Phytotoxicity was observed only at temperatures above 26° C.

7527. Albert, J. J., and Groves, A. B. **The efficacy of glyodin plus dodine on the conidia of *Venturia inaequalis*.** From abstr. in *Phytopathology*, 1965, **55**: 503.

Inoculated potted apple seedlings with visible scab foliage infections were sprayed with several fungicides. Spore germination tests were made at 4, 7, 10 and 14 days after the fungicide applications. A combination of glyodin at 12 oz. plus dodine at 2 oz. per 100 gal. of water suppressed spore germination for as long a period of time as that caused by 8 oz. of dodine alone. Glyodin plus dodine was more effective than 48 oz. of glyodin, 2 oz. of dodine, 2 lb. of captan or 1 lb. of captan plus 4 oz. of dodine per 100 gal. of water.—Fruit Res. Lab. Winchester, Va.

7528. Heuberger, J. W., and Connor, S. R.
Time-of-application studies in the apple cover spray program in Delaware. From abstr. in *Phytopathology*, 1965, **55**: 504.

In 1963 the standard schedule was compared with a widely extended one of intervals of 14 days (first to third cover), 17 days (fourth to fifth cover) and 21 days (sixth to seventh cover), thus saving 2 applications. In 1964 three timing schedules were used: the standard, the widely extended, and a medium extended schedule with intervals of 12 days (first to third cover), 14 days (fourth to sixth cover) and 17 days (seventh to eighth cover), thus saving 1 application. Disease data showed that all 3 schedules were equally effective for fruit scab [*Venturia inaequalis*] control. Descending order of effectiveness of the schedules for scab control on terminals and sooty blotch [*Gloeodes pomigena*] on fruit was standard, medium extended and widely extended, respectively. The data indicate that opening up the time interval sequence from 10–12–14 days (nine applications) to 12–14–17 days (eight applications) may be practicable, thus saving 1 application.—Univ. Del., Newark.

7529. Dragožinskaja, V. M.
Pear immunity to scab. [Russian, with English summary 6 lines.] *Tr. priklad. Bot. Genet. Selekc.*, 1964, **36**(3): 81-93, bibl. 20.

From 360 pear varieties studied over a number of years, 60 were selected as being immune or highly resistant to scab (*Venturia pirina*).

7530. Jenkins, P. T., and Reinganum, C.
The occurrence of a quiescent infection of stone fruits caused by *Sclerotinia fructicola* (Wint.) Rehm. *Aust. J. agric. Res.*, 1965, **16**: 131-40, bibl. 13, illus.

Cultural evidence, together with field observations, indicate that a quiescent infection of immature peach and apricot fruits by *Sclerotinia fructicola* occurs naturally in the orchard, particularly in a season of moderate to severe blossom infection. Fruit losses during a dry harvest period are ascribed in the main to the activation of quiescent infections during fruit ripening. The results of a spray trial demonstrate that some measure of control of quiescent infection can be achieved by applying eradicant sprays during blossoming, and thus provide circumstantial evidence that a proportion of such infections can be established during this period. [From authors' summary.]—Vict. Dep. Agric., Burnley.

7531. Chitzanidis, A.
Preliminary tests on the control of *Sclerotinia laxa* Aderh. & Ruhl. by the use of eradicant fungicides. *Ann. Inst. phytopath. Benaki*, 1964, **6**: 129-45, bibl. 12.

Trials were carried out with 9 eradicant fungicides on detached dead twigs of sour cherry. All prevented the formation of sporodochia on the twigs. The best results were obtained with monocalcium arsenite, sodium pentachlorophenate and sodium dinitro-o-cresolate. Of the 5 organo-mercury compounds tested, only Ortho LM Apple Spray (10·2% methyl mercury hydroxyquinolinate) was effective at practicable, low concentrations. The use of eradicant sprays in the orchard during the winter reduced the number of sporodochia produced and reduced blossom infection; the addition of stickers did not improve the efficacy of the orchard sprays. Monocalcium arsenite and sodium pentachlorophenate, however, did not always kill the mycelium in the host tissues and were less effective in the orchard than on detached twigs. None of the sprays tested was phytotoxic.

7532. Zavarzin, V. I.
***Cytospora* and the desiccation of peach trees.** [Russian.] *Sadovodstvo*, 1965, No. 3, pp. 25-6, illus.

In a comparison of healthy trees and trees artificially or naturally infected with *Cytospora* spp. the moisture content of the leaves and shoots was lower, and the reduced ascorbic acid content higher, in infected than in healthy trees. The ammonium-N content of artificially infected leaves was double, but the amide-N content only a quarter of, that of healthy leaves. Similar effects of the fungus on the physiological processes were observed in naturally infected trees but they were less marked.

7533. Daines, R. H.
2,6-Dichloro-4-nitroaniline used in orchard sprays, the dump tank, the wet brusher and the hydrocooler for control of *Rhizopus* rot of harvested peaches. *Plant Dis. Reptr*, 1965, **49**: 300-4, bibl. 9.

Captan and DCNA sprays applied to peaches during the last 18 days before harvest did not prevent the development of post-harvest decay (mainly *Rhizopus* rot) following grading. DCNA applied in the hydrocooler was effective at $\frac{1}{8}$ lb. per 100 gal., but not at $\frac{1}{16}$ lb. The use of 200 p.p.m. of chlorine, supplied by calcium hypochlorite, in the hydrocooler and DCNA applied in the dumping tank or as a spray during brushing were all ineffective. *Rhizopus stolonifer* appeared to be the most prevalent species.—N.J. agric. Exp. Stat., New Brunswick.

7534. Lukezic, F. L., DeVay, J. E., and English, H.
Comparative physiology and pathogenicity of *Leucostoma persoonii* and *Rhodosticta quercina*. *Phytopathology*, 1965, **55**: 511-18, bibl. 23, illus.

The causal organisms of 2 severe canker diseases of President plum trees are *Leucostoma persoonii* and *Rhodosticta quercina*. *L. persoonii*, which comprises many strains including non-pathogens and pathogens of various stone fruit species, is widespread in California. By contrast, *R. quercina* has only been found in 2 places in California and is pathogenic only on President plum trees. [From authors' abstract.]—Univ. Calif., Davis.

7535. Cole, J. R.
Liver spot disease of pecan extends its range into Georgia. *Plant Dis. Reptr*, 1965, **49**: 148, bibl. 1, illus.

Originally reported in 1933 [*H.A.*, 4: 224] as of major importance in the south-western United States, liver spot disease (*Gnomonia caryae* var. *pecanae*) was not recorded east of the Mississippi until 1964 when diseased trees of the Pabst variety were observed in Georgia. Although Pabst trees were sprayed with 5 applications of 1% dodine and 3 applications of 2% Karathane, the fungus was only partially controlled. In Georgia the disease has been found to affect only the Pabst variety.—U.S.D.A., Albany, Ga.

7536. Barnes, G. L.
Effectiveness of some new fungicide formulations for control of pecan scab in Oklahoma. *Plant Dis. Reptr*, 1965, **49**: 285-7, bibl. 8.

Over 2 seasons the new fungicides Dithane M-45, DuTer W20 (triphenyl tin hydroxide), TC-90 (copper salts of fatty and rosin acids), Dyrene 50WP (dichloro(chloro-anilino)-triazine) and Polyram 80WP (zinc carbamates) gave as good control of *Fusicladium effusum* as did zineb and dodine. The addition of a sticker to dodine did not improve its effectiveness. [For related work see *H.A.*, 35: 770.]—Okla. agric. Exp. Stat., Stillwater.

7537. Wilhelm, S., Bringhurst, R. S., and Voth, V.
Origins of *Rubus* cultivars resistant to *Verticillium* wilt. *Phytopathology*, 1965, **55**: 731-3, bibl. 10, illus.

Rubus species found resistant to *Verticillium* wilt (*V. albo-atrum*) were the Pacific Coast trailing blackberry, *R. ursinus*, as represented by the cultivars Ideal (Santiam), Jenner and Zielinski; *R. procerus* and *R. laciniatus*, the Himalaya and Evergreen blackberries, respectively; and the diploid *R. ulmifolius* var. *inermis* and a similar but tetraploid form known as Merton Thornless. Resistant cultivars derived in part from *R. ursinus* are Black Logan, Cascade, Chehalem, Logan, Mammoth, Marion, Olallie, Pacific and Phenomenal; those derived in part from *R. procerus* are Chehalem and Marion. Cultivars derived from 2 resistant parents were resistant, whereas cultivars derived from resistant × susceptible parents were either resistant or susceptible. A progeny derived from Olallie (resistant) by selfing segregated sharply for resistance (60·6%) and susceptibility (39·4%), in contrast to similar progenies from Eldorado and Boysen (both susceptible), where all were susceptible. Certain cultivars derived from *R. occidentalis*, *R. idaeus*, *R. idaeus* × *R. strigosus* and *R. allegheniensis* proved susceptible. [From authors' abstract.]—Univ. Calif., Berkeley and Davis, and South Coast Field Stat., Santa Ana, Calif.

7538. Converse, R. H., and Schwartze, C. D.
***Phytophthora* sp. from Washington pathogenic on roots of red raspberry.** From abstr. in *Phytopathology*, 1965, **55**: 503.

A *Phytophthora* sp. was isolated from necrotic roots of the red raspberry variety Canby. Greenhouse inoculations with this isolate caused necrosis and vascular reddening in roots of 4 Pacific coast red raspberry cultivars, paralleling their field susceptibility to the wet soil root rot in the Pacific Northwest. The fungus, at first suspected of being a race of *P. fragariae*, failed to infect any of the Beltsville standard strawberry red stele differential hosts. The fungus (which may be involved in the etiology of the wet soil root rot of raspberries in the Pacific Northwest) does not appear to be referable to any recognized species of *Phytophthora*.—U.S.D.A., Beltsville, Md, and Wash. St. Univ., Puyallup.

7539. Govorova, G. F.
The strawberry disease caused by the fungus *Phytophthora fragariae* Hickm. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 54, pp. 105-10, bibl. 19, illus.

When a large number of varieties was tested for resistance, 21% at Soči and 26% at Šuntuki were not infected. Some of the most severely affected and the resistant varieties found in Šuntuki are listed. Prevention, rather than chemical treatment, is recommended for control.

7540. Kotani, A., Suzuki, I., and Shimada, H.
Studies on breeding strawberries for [resistance to] root rot diseases. II. New clones highly resistant to root rot disease, Okitsu No. 11 to No. 17. [Japanese, with English summary ⅜ p.] *Bull. hort. Res. Stat. Okitsu, Ser. B*, 1965, No. 4, pp. 37-43, bibl. 5.

The commercial characteristics are described of 7 selections which show the same degree of resistance to root rot (probably caused by *Phytophthora fragariae*, alone or in combination with other fungi) as the variety Temple, and are suitable for processing and for fresh consumption. [For part I see *H.A.*, 33: 2505.]

7541. Barbe, G. D., and Hewitt, W. B.
The principal fungus in the summer bunch rot of grapes. *Phytopathology*, 1965, **55**: 815-16, bibl. 14, illus.

Mycological studies have shown that the principal bunch rot fungus of grapes was closer to *Diplodia natalensis* than to *D. viticola*.—Univ. Calif., Davis.

7542. Nagy, L. S., and Glits, M.
A *Botrytis cinerea* Pers. gomba kártétele szőlővesszőn. (**The damage caused to vine shoots by *Botrytis cinerea*.**) [Russian and French summaries ½ p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 193-208, bibl. 10, illus.

An illustrated description is given of the damage caused by *B. cinerea* on vine scion and rootstock shoots and grafts, the main symptoms of which are necrosis and browning of the wood. During storage of the grafts in outdoor pits the disease developed more rapidly and caused greater losses in shoots at the top, which were more exposed to rain and heat, than in those at the bottom. Infection unnoticed at the time of grafting developed during stratification and reduced the percentage of take. Chemical control has not so far been satisfactory.

7543. Lamberti, F.
Importanza di vitigni a maturazione tardiva nell'epifitologia della muffa grigia (*Botrytis cinerea* Pers.). (**The importance of vine varieties with late-ripening wood in the spread of grey mould (*Botrytis cinerea*).**) *Phytopath. medit.*, 1965, **4**: 54-5, illus.

Insufficiently matured shoots of the vine variety Ohanez formed reservoirs of *Botrytis* infection during the winter, with consequent damage to subsequently developed leaves and fruit. In Regina and Italia such infection was rare, occurring only when the growing season was abnormally prolonged, and the varieties Cardinal and Panse Précoce, on which the wood matures early, were free from shoot infection.—Univ. Bari.

7544. Surjal', G. F.
The inheritance of resistance to downy mildew in grape vines. [Russian, with English, French and German summaries ¼ p. each.] *Vestn. sel'sk. Nauki*, 1965, **10**(4): 137-43, illus.
See also *H.A.*, 35: 3177.

7545. Nacarašvili, A.
Zineb in viticulture. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(3): 24.
Zineb (82%) at 0·5% sprayed 9–10 times up to and at the time of flowering, followed by 2–3 applications of bordeaux mixture, gave good control of downy mildew. Additional applications of sulphur dust, alone or combined with the zineb sprays, were necessary when powdery mildew was present. Applications of zineb stimulated plant growth and increased fruit set.

7546. Gaudineau, M., and Bugaret, Y.
Essais de fongicides en 1963 sur mildiou de la vigne. **(Trials of fungicides in 1963 for control of vine mildew.)** *Phytiat.-Phytopharm., Paris*, 1964, **13**: 123-9, bibl. 2.
Two formulations (standard and improved) of the cupro-organic fungicide P (containing zineb) at 0·3, 0·4 and 0·5% were compared with bordeaux mixture at 2% and with the new cupro-organic fungicide A (8% maneb +20% copper) at 0·6% for the control of *Plasmopara viticola*. The improved formulation of the fungicide P (containing both zineb and ferric ferrocyanide) at 0·4 and 0·5% gave the best degree of control; there was little difference in efficiency between bordeaux mixture, fungicide A at 0·6% and fungicide P (standard) at 0·5%. [For earlier work see *H.A.*, 34: 4555.]—I.N.R.A Stat. Path. vég. Sud-Ouest, Pont-de-la-Maye.

7547. Gärtel, W.
Vertrocknungen an Traubenstielen als Folge späten Oidiumbefalls. **(The withering of grape stalks resulting from a late attack of powdery mildew.)** [English and French summaries ¼ p. each.] *Weinberg u. Keller*, 1965, **12**: 61-70, bibl. 10, illus.
Infection by *Uncinula necator* in the Moselle Valley in the late summer of 1964 caused many of the grape stalks to wither and the fruit to wilt; this is a rare condition, easily missed until too late. The variety Müller-Thurgau and K-deficient vineyards were particularly susceptible. The symptoms were due to a disturbance of the water supply to the grapes resulting from the rupture of the epidermis.—Inst. Rebenkrankh., Bernkastel-Kues.

Nematodes.

(*See also* 7504, 7506, 7609.)

7548. Pitcher, R. S., and Flegg, J. J. M.
Observations of root feeding by the nematode *Trichodorus viruliferus* Hooper. *Nature*, 1965, **207**: 317, bibl. 2.
Observations carried out from an underground root observation laboratory showed that a high proportion of the growing tips of extending apple tree roots were attacked by colonies of *T. viruliferus*. Root extension usually ceased after 5–15 days of feeding, although the meristem itself was not the focus of attack. Severely damaged parts of the root often swelled and occasionally the surface split.—E. Malling Res. Stat., Kent.

7549. Garofalo, F.
Prove orientative di lotta con Nemagon (1,2-dibromo-3-chloropropano) contro i nematodi infestanti le colture ortive e fruttifere del Piemonte. **(Preliminary tests with Nemagon (dibromochloropropane) for nematode control in vegetable and fruit crops in Piedmont.)** *Not. Mal. Piante*, 1964, No. 70/71, pp. 375-82, bibl. 7.
Nematodes (*Aphelenchoides* sp.) in the soil under peach trees were effectively controlled by Nemagon applied 20–30 cm. deep, the 20% granular form at 240 g. per tree and the liquid form (87% E.C.) at 40 g. in 14 l. of water per tree. The trees showed no signs of injury. In mid-August treatments of strawberry beds with the same products the liquid was applied 15–20 cm. deep at 110 g./sq. m. in 100 l. and in some cases allowed to wet the outer leaves. The granules were applied at 500 g./sq. m. in contact with the roots. Within 45 days of the treatments no living adults, larvae or eggs of *Aphelenchoides ritzema-bosi* remained and the plants were not injured. A celery crop was treated in the same way, with an additional plot which received twice the rate of the granular product. The sprayed leaves were slightly injured, but a growth check on liquid-treated plots was followed by marked growth stimulation. With the single dose of granules the check was more prolonged and the subsequent stimulation slight or absent. The treatments appeared to increase chlorophyll production. Root infestation by *Ditylenchus* sp. was reduced from 78% in the control to 30% by the granules and to 28% and 22% by the single and double doses of liquid, respectively.—Osserv. Mal. Piante, Torino.

7550. Bird, G. W., and Jenkins, W. R.
Effect of cranberry bog flooding and low dissolved oxygen concentrations on nematode populations. *Plant Dis. Reptr*, 1965, **49**: 517-18, bibl. 10.
Five species of stylet-bearing nematodes were recovered from the soil in a cranberry bog that had been flooded for 2 years. The numbers recovered were similar to those found in bogs under normal culture. Populations of nematodes and dissolved-oxygen concentrations were found to remain constant for 145 days in flooded glass crocks containing rooted cranberry cuttings. [From authors' abstract.]—Rutgers Univ., New Brunswick, N.J.

7551. van Eijden, J., and Wijshoff, J.
Schadelijke aaltjes in de aardbeienteelt. **(Injurious eelworms in strawberries.)** *Groent. en Fruit*, 1965, **20**: 1951.
See *H.A.*, 35: 5459.

7552. Metlickij, O. Z.
Stem nematodes in the non-chernozem region of the R.S.F.S.R. [Russian.] *Sadavodstvo*, 1965, No. 3, pp. 33-4, illus.
Vapam at the rate of 250 g. per 10 l. per sq. m., applied to the soil after ploughing in the strawberry plants, is recommended for the control of stem nematodes (*Ditylenchus dipsaci*). At this concentration Vapam also has some herbicidal and fungicidal effects. Well rooted runners may be treated with a solution of parathion at a concentration of not less than 1·2%.

7553. Raski, D. J., Hart, W. H., and Kasimatis, A. N.
Nematodes and their control in vineyards. *Circ. Calif. agric. Exp. Stat. Ext. Serv.* **533**, 1965, pp. 23, illus.

Mites.

(*See also* 7498, 7575, 7576.)

7554. Bognár, S.
A fitofág atkák és a kertészeti növények közötti biocönológiai kapcsolatok kérdései. **(The problem of biocenological relationships between phytophagous mites and horticultural plants.)** [English and Russian summaries ¾ p. each.] *Kert. szől. Főisk. Közlem.*, 1964, **28**(1, part 2): 329-42, bibl. 26.

In Hungary the most frequently occurring mites on apples are *Byrobia praetiosa* and *Tetranychus viennensis*, on pears *Eriophyes pyri*, on plums *Panonychus ulmi*, on peaches *B. redikorzevi* and *Vasates fockeui*, on vines *Epitrimerus vitis* and on vegetables *Tetranychus telarius*. Control is discussed in relation to biological and ecological factors. [See also *H.A.*, 31: 6177.]

7555. Vojtenko, A. N.
New acaricides. [Russian.] *Sadovodstvo*, 1965, No. 3, p. 26.

Trials are reported on the control of brown fruit mites on apples. Phosphamidon (0·05–0·2%), Trichlormetafos-3 (50% e.c.) and Rodocid all gave better results than parathion and had longer residual effects.

7556. Di Stefano, M., and Tremola, E.
Esperimenti di lotta invernale in Campania dal 1956 al 1959 contro il ragnetto rosso dei fruttiferi (*Metatetranychus ulmi* Koch.) **(Experiments in Campania from 1956 to 1959 on the winter control of fruit tree red spider mites (*Panonychus ulmi*).)** [English summary 2¼ pp.] *Ann. Fac. Sci. agr. Napoli*, 1959-1960, **25**: 97-145, bibl. 34, illus., [received 1965].

Very good control was achieved with Dytrol (a mixture of white mineral oil and DNOC) at 3% on stone-fruit trees and 5% on pome-fruit trees. Poor results were obtained with lime-sulphur, phosphoric esters (alone or mixed with organic sulphonates), various specific acaricides and HCN fumigation.

7557. Unterstenhöfer, G., and Kremer, F. W.
New methods for controlling spider mites on fruit crops. *PflSch.-Nachr. Bayer*, 1965, **18**: 24-33, bibl. 5.

The new fungicide Morestan (6-methyl-quinoxaline-2,3-dithiolcarbonate) has a distinct acaricidal effect, but can only be used at low concentrations except during dormancy because of its phytotoxicity, and is more effective against eggs and larvae than against adults. Trials for the control of *Metatetranychus ulmi* showed that single or repeated treatments at 0·0075% have a good immediate (but no residual) effect against the post-embryonic stages, that Morestan gives 85 and 90% control of summer eggs when applied at 0·01 and 0·015%, respectively, and that it gives better control of winter eggs than does the standard winter oil treatment when applied at 0·1% just before bud burst. At 0·05 or 0·1% Morestan also gives good control of winter eggs of *Psylla pyri*.

7558. Boulanger, L. W.
Preventive control programs for European red mite. *Me Fm Res.*, 1965, **13**(1): 32-4.

In 2 years' trials on apples pink-bud and/or petal-fall applications of demeton, Tedion, Animert, Kelthane and Imidan all gave excellent control of *Panonychus ulmi*.

7559. Muir, R. C.
The effect of sprays on the fauna of apple trees. I. The influence of winter wash, captan, and lime-sulphur on the interaction of populations of *Panonychus ulmi* (Koch) (Acarina : Tetranychidae) and its predator, *Blepharidopterus angulatus* (Fall.) (Heteroptera : Miridae). II. Some aspects of the interaction between populations of *Blepharidopterus angulatus* (Fall.) (Heteroptera: Miridae) and its prey, *Panonychus ulmi* (Koch) (Acarina: Tetranychidae). *J. appl. Ecol.*, 1965, **2**: 31-41, bibl. 12; 43-57, bibl. 11.

Part I: The influence of routine sprays of winter wash (0·1% DNOC+3·0% petroleum oil), lime-sulphur and captan on populations of *P. ulmi* and its predators was studied from 1953 to 1959 in a 5-acre apple orchard. During this period there were 2 marked fluctuations in the populations of both *P. ulmi* and *B. angulatus*, the only predator present in numbers. Highest populations of the mite occurred in 1956 and 1958, whereas those of *B. angulatus* occurred in 1957 and 1959, coinciding in both years with a drastic reduction in the numbers of mites. Although DNOC-petroleum oil and lime-sulphur had some acaricidal effect on mite populations, the full extent of the population changes was largely determined by treatment effects on the predator. Populations of *P. ulmi* were inversely proportional to those of *B. angulatus*, which were generally highest on plots treated with captan, and lowest where winter wash+lime-sulphur was used. The numbers of mites and eggs per leaf recorded at the peak of the second cycle for the treatments with the least and greatest effects on *B. angulatus* were: 20 (captan), 85 (lime-sulphur), 220 (winter wash+captan) and 220 (winter wash + lime-sulphur). *B. angulatus* was observed also to feed on leaf hoppers and, when the predator was abundant in 1959, there were fewer leaf hoppers. *Typhlodromus* mites were observed only on the captan-treated plots; their numbers were smaller in years when *B. angulatus* was abundant. [From author's summary.] *Part II*: *P. ulmi* hatched 4–5 weeks before *B. angulatus*, and in years when the predator severely checked the mite predation was effective at the beginning of the second mite generation. In 1956, following treatment with either winter wash+lime-sulphur or captan, the numbers of mites and eggs increased at a similar rate before *B. angulatus* hatched, but declined rapidly when the predator appeared, the rate of decrease being proportional to the numbers of the predator. There was no evidence of effective predation by any other species before *B. angulatus* hatched. In 1958, when mite density was greater than 30 mites plus eggs per leaf, there was a clear relationship between the rate of mite increase and the mean density of *B. angulatus*. The rate of mite increase in the absence of predation was calculated to be 5·3% per day, and the mean number of predators required to stabilize the mite population was 57 per tree. From estimates of total numbers of mites and predators per tree it was shown that one predator could stabilize a population of approximately 2,000 mites and eggs, of which 40% were mites. The egg density of *B. angulatus* was low following seasons when the mite was scarce due to heavy predation, and higher when mite density increased. [From author's summary.]—E. Malling Res. Stat., Kent.

7560. MUIR, R. C.
The effect of sprays on the fauna of apple trees. III. The influence of certain fungicides and petal-fall insecticides on the fruit tree red spider mite, *Panonychus ulmi* (Koch) and its predators. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 157-70, bibl. 5.

The effects of fungicide spray programmes of captan, captan + dinocap, lime-sulphur, lime-sulphur pre-blossom followed by dispersible sulphur, and the insecticides nicotine and γ-BHC at petal-fall, on the fruit tree red spider mite and its predators were observed in an apple orchard. The susceptibility of eggs of the predatory mirid *Blepharidopterus angulatus* to typical fungicide spray programmes of captan, dinocap, lime-sulphur, DNOC + petroleum oil applied as a winter wash, and demeton-methyl as a green-cluster spray was studied under insectary conditions. No effects attributable to either nicotine or BHC on any of the recorded species could be detected. Populations of *P. ulmi* did not tend to increase with the captan or captan + dinocap schedules, with both of which the ratio of *P. ulmi* to *Typhlodromus pyri* was also satisfactory. Lime-sulphur reduced the numbers of *T. pyri*, so that *P. ulmi* tended to increase, especially with the lime-sulphur + dispersible sulphur treatment. The eggs of *B. angulatus* were susceptible to DNOC + petroleum and to lime-sulphur, the percentage hatch being 58·5 and 53·8 respectively, compared with 82·6% for the untreated controls. It is concluded that fungicide spray programmes of captan + dinocap, and petal-fall sprays of either nicotine or BHC, are unlikely to reduce the predator population to such an extent as to result in a mite outbreak. [Author's abstract. For earlier work see *H.A.*, 32: 4715.]

7561. COLLYER, E.
Cannibalism as a factor affecting mortality of *Blepharidopterus angulatus* (Fall.) (Heteroptera: Miridae). *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 177-8, bibl. 4.

Small apple trees were inspected 3 times a week and all predatory insects observed were removed. By the end of the hatching period populations of *Blepharidopterus angulatus* were estimated to be only 28% less than on untreated trees, although numbers equal to the final population on the latter had been removed. It is suggested that mortality on the control trees resulted mainly from cannibalism, and this should be considered when interpreting the results of field experiments in which mortality due to other factors is under study. [Author's abstract.]

7562. NIEMCZYK, E.
The distribution of *Typhlodromus pyri* Scheut. (Acarina: Phytoseiidae) on apple trees in spring. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 180-3, bibl. 8.

Females, which over-wintered in protected positions on the trunk and main branches, resumed activity between bud-burst and the late green-cluster stage. During this time the mites showed a marked preference for sheltered habitats, and were found successively under loose bud scales and in crevices in developing fruit buds, between the bases of the floral pedicels and in flower buds. From green-cluster onwards an increasing proportion were found on the undersides of the leaves until, at the end of the blossom period, this became the only important habitat. The toxicity of 0·03% γ-BHC + 0·05% DDT applied at green-cluster is reported, and the effect of habitat on survival is discussed. [Author's abstract.]

7563. HOYT, S. C.
Helpful mites control Washington rust mites. *West. Fruit Gr.*, 1965, **19**(5): 16.

Recently, low dosages of Guthion and in some instances DDT + parathion have been used successfully to control codling moth on apples while allowing sufficient survival of *Typhlodromus occidentalis* to control McDaniel spider mite and European red mite. Thiodan, Systox and phosphamidon have also shown promise for use in an integrated spray programme.—Wash. St. Univ., Wenatchee.

7564. FOOTT, W. H.
A strain of *Tetranychus urticae* from the ground cover of an apple orchard resistant to chlorfenson. *Canad. J. Plant Sci.*, 1965, **45**: 226-8, bibl. 1.

A strain of *Tetranychus urticae* developed a low level of resistance to chlorfenson when the material drifted to the ground cover while apple trees were being sprayed for control of *Panonychus ulmi*. After being reared in the greenhouse for 4 years without further exposure to chlorfenson *T. urticae* lost its resistance. When Kelthane was substituted for chlorfenson as a control for *P. ulmi* the spray drift that reached the ground cover virtually eliminated *T. urticae* from the orchard. [From author's abstract.]—Res. Stat., Harrow, Ont.

7565. WESTIGARD, P. H., AND LOMBARD, P. B.
Oregon is wooing the beneficial mites too. *West. Fruit Gr.*, 1965, **19**(5): 17.

Field data collected over the past 2 years indicated that an uncontrolled build-up of two-spotted spider mites [*Tetranychus urticae*] reduced both the yield and quality of pears, but that the presence of the pest in moderate numbers did not interfere with tree performance. When sprays for the control of other pests were omitted, *Typhlodromus occidentalis* suppressed the two-spotted spider mite by mid-August, but only after the pest had reached an average density of 20 per leaf. At this density fruit size and yields were unaffected, although injured leaves were quite evident.—Ore. St. Univ.

7566. DE ROSA, M.
L'eriofide delle gemme di nocciolo. **[Bud mite infestation of hazels.]** *Progr. agric., Bologna*, 1965, **11**: 550-3, illus.

A review on *Phytoptus avellanae* and its control.

7567. RYMASHEVSKAJA, R. S.
Spider mites on currants. [Russian.] *Sadovodstvo*, 1965, No. 4, p. 21.

Studies on the mite populations on [black] currant bushes in the Tambov region throughout the vegetative period showed a direct relationship between the numbers of spider mites [*Tetranychus urticae*] and of the predator *Typhlodromus* spp.

7568. PAVLOVA, N. M.
The possibilities of developing black currant varieties resistant to big bud mite. [Russian, with English summary 8 lines.] *Tr. prikl. Bot. Genet. Selekc.*, 1964, **36**(3): 94-102, bibl. 34.

Studies on cultivated and wild black currants showed that forms resistant to *Cecidophyopsis ribis* occurred most frequently in the Siberian sub-species *Ribes nigrum* ssp. *sibiricum*. Four resistant seedlings were selected for use in breeding.

7569. Jones, J. M.
Warm water treatment of blackcurrant cuttings. *Expts on Welsh Fms*, 1965, pp. 41-3.

Black currant cuttings immersed in warm water at 100° F. for 150 min., 112° for 120 min. or 115° for 60 min. survived and gave rise to vigorous bushes. Gall mites and their eggs were killed after treatment for 30, 20 and 15 min., respectively, at these temperatures. The safest treatment was immersion for 30 min. at 110°. Varietal differences in tolerance were not important under these conditions of treatment.—N.A.A.S., Trawscoed, Cardiganshire.

7570. Boller, E.
Die Johannisbeergallmilbe auch in der Schweiz. **(The black-currant gall mite is in Switzerland too.)** *Schweiz. Z. Obst- u. Weinb.*, 1965, **101**: 315-16, bibl. 3, illus.

Severe attacks by *Phytoptus ribis* have occurred in N.E. Switzerland. Control recommendations include the removal and burning of infested shoots, and the application of 3 sprays of 1% lime-sulphur at fortnightly intervals, beginning about the end of March when the racemes have appeared but the flowers are not yet open. —Eidg. Versuchsanst., Wädenswil.

7571. Thresh, J. M.
The chemical control of black currant reversion virus and its gall mite vector (*Phytoptus ribis* Nal.). *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 152-7, bibl. 11.

Endrin, endosulfan, lime-sulphur, colloidal sulphur and fluoroacetamide were each applied 5 times to batches of healthy black currant bushes in 1963, in attempts to control the spread of reversion virus and its gall mite vector (*Phytoptus ribis*) from adjacent unsprayed bushes. Endrin gave virtually complete control of mites, and endosulfan and fluoroacetamide were almost as effective. However, endrin reduced the incidence of virus, whereas endosulfan and fluoroacetamide did not. Lime-sulphur and colloidal sulphur damaged growth and were the least effective materials against mites, yet they reduced virus infection. The design of field experiments on the control of mites and reversion, and their relevance to commercial practice, are discussed in relation to the way in which the different materials affect mites. [Author's abstract.]

7572. Kirby, A. H. M., and Bennett, M.
Gall mite control on black currant: phytotoxicity of lime sulphur sprays. *Plant Path.*, 1965, **14**: 60-6, bibl. 12.

Wellington XXX and Westwick Choice bushes were sprayed 4 times in each of 3 seasons with 1% lime-sulphur at 300–450 gal./acre or with 100% lime-sulphur at 4–7 gal./acre. The treatments reduced the growth and yield of both varieties. Extension growth was less with undiluted than with diluted lime-sulphur. It is considered very probable that the effects would be serious if an efficient wetting agent were added to the high-volume wash.—E. Malling Res. Stat., Kent.

7573. Čerkasskij, E. S., and Šmal'ko, V. F.
Something new in the control of strawberry mite. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 54, pp. 102-5, bibl. 6.

Data are summarized from several experiments on the use of activated Creolin containing 3% γ-BHC against *Tarsonemus pallidus* on strawberries. A single post-harvest application of a 3% emulsion of activated Creolin kept the plants free of mite damage for 2–3 years and greatly increased yields; the runners produced were also free from mites. As a prophylactic treatment spraying with a 2% emulsion is recommended.

7574. Bonu, V.
Sulla vite trattamenti "inizio primavera" nella lotta acaricida. **(Early spring treatments of vines for mite control.)** *Riv. Vitic. Enol.*, 1965, **18**: 255-6.

The increase of mite infestation of vines in the Piedmont area is attributed to the widespread use of non-copper fungicides and organophosphoric and chlorinated insecticides. The treatment recommended is the application of 6% colloidal mercaptan a week before the buds swell. This compound is particularly effective against hibernating adults of the yellow mite (*Eotetranychus carpini*), and also controls powdery mildew and grey mould (*Botrytis cinerea*). Further treatments in spring and summer with organic compounds of copper and sulphur are necessary for controlling red mites (*Metatetranychus ulmi*) and downy and powdery mildews.—Scuola media Caselle Torinese.

Insects.

(*See also* 7508, 7563.)

7575. Reich, R.
Das Auftreten tierischer Schädlinge und ihre Bekämpfung im Rahmen unserer Spritzfolge. **(The occurrence of insect pests and their control within the framework of our spray programme.)** *Mitt. ObstbVersuchsringes, Jork*, 1965, **20**: 128-32, illus.

In experiments in the lower Elbe district in 1964 the pests investigated and the insecticides which gave the best results were: apple red spider mite (Animert), apple capsid (parathion), apple sawfly (dimethoate, Gusathion, lindane-DDT, Metasystox, parathion), plum sawfly (dimethoate, Metasystox, parathion) and apple leaf miner (Gusathion).

7576. Marucci, P. E.
Insects and bud mites in blueberries. *Proc. 32nd annu. Blueberry Open House, Hammonton, N.J., 1964*, pp. 21-4.

None of the newer insecticides tested against blueberry pests was significantly better than the standard materials recommended, i.e. parathion and Guthion against fruitworms, and malathion against maggot and bud mites.—Rutgers Univ.

7577. Ministry of Agriculture, London.
Plum aphids. *Adv. Leafl. Minist. Agric., Lond.*, **34**, revised 1965, pp. 5, illus.

Control of the leaf-curling plum aphid (*Brachycaudus helichrysi*), the mealy plum aphid (*Hyalopterus pruni*) and the damson-hop aphid (*Phorodon humuli*).

7578. Briggs, J. B.
The distribution, abundance, and genetic relationships of four strains of the rubus aphid (*Amphorophora rubi* (Kalt.)) in relation to raspberry breeding. *J. hort. Sci.*, 1965, **40**: 109-17, bibl. 7.

For resistance to the aphid.

7579. Denisova, T. V.
The phenol complex as a resistance factor in vine roots affected by phylloxera. [Russian.] *Vestn. sel'sk. Nauki*, 1965, **10**(5): 114-18, bibl. 22, illus.

Chromatographic studies on the contents of phenolic compounds in the roots of healthy and phylloxera-affected vine seedlings showed that resistance to phylloxera attack depended on the amount and chemical composition of the compounds and on their localization in the damaged tissue.

7580. E̊berg, A.
The apple blossom weevil. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(5): 39-40, illus.

The biological control of the weevil by naturally occurring and released populations of *Pimpla* sp. is discussed. Sprays of a spore suspension of *Beauveria* spp. gave excellent control over a 4-year period.

7581. Cram, W. T.
Fecundity of the root weevils *Brachyrhinus sulcatus* and *Sciopithes obscurus* on strawberry at different conditions of host plant nutrition. *Canad. J. Plant Sci.*, 1965, **45**: 219-25, bibl. 8.

Field applications of N, P and K to strawberries had no significant effect on the fecundity of *Sciopithes obscurus* fed on detached leaflets in the laboratory, but when N was not applied there was a significant reduction in the fecundity of *Brachyrhinus sulcatus*. With strawberries in sand culture low levels of N had no apparent effect on the fecundity of *S. obscurus*, but were associated with a significant reduction in the fecundity of *B. sulcatus*. Some association is suggested between the different effects of N nutrition on these species and their different susceptibilities to cyclodiene insecticides. [From author's abstract.]—Canada Dep. Agric., Vancouver, B.C.

7582. Cram, W. T.
Fecundity of the black vine weevil on strawberry with nitrogen supplied in the ammonium or nitrate form. *Canad. J. Plant Sci.*, 1965, **45**: 295-6, bibl. 4.

Plants of British Sovereign grown in sand were supplied with 2 levels of N in both nitrate and ammonium forms. When adult *Brachyrhinus sulcatus* weevils were allowed to feed on them, the form of N had no significant effect on the degree of fecundity of the weevils.—Canada Dep. Agric., Vancouver, B.C.

7583. Grbić, V.
Proučavanje života i suzbijanja *Otiorrhynchus lavandus* Germ. **(Studies on the biology and control of *Otiorrhynchus lavandus*.)** [English summary 3½ pp.] *Zašt. Bilja*, 1964, **15**: 463-564, bibl. 49, illus.

In this slightly abridged thesis detailed results are given of work on the life history of *O. lavandus*, a serious pest of vines in Yugoslavia. Natural enemies of this weevil include *Beauveria bassiana*, *Metarrhizium anisopliae*, several species of fungi, moles, hedgehogs, pheasants and nematodes. In laboratory and field control experiments the efficacy was tested of 14 insecticides applied by 4 different methods. The best results were obtained by wet dusting with Repisan P-3 (lindane 2·1%+dieldrin 0·9%), lindane 2·8% and Sevin, all at 30–40 kg./ha., and by mist application of Neosol 10 (DDT 10%+lindane 7%).

7584. Portman, R. W.
Knock out cherry fruit fly. *Idaho curr. Inf. Ser.* **9**, 1965, pp. 2, illus.

Recommended spray programmes.

7585. Russo, G., and Tremola, E.
I risultati della sperimentazione della lotta contro la mosca delle ciliege (*Rhagoletis cerasi*) in Campania nell'anno 1959. **(The results of experiments on the control of the cherry fruit fly (*Rhagoletis cerasi*) in Campania during 1959.)** [English summary ½ p.] *Ann. Fac. Sci. agr. Napoli*, 1959-1960, **25**: 317-28, illus., [received 1965].

Very good control was achieved by a single treatment between mid-April and late May with 0·15% emulsifiable DDT, followed in early June by 0·06% emulsifiable parathion or by 2 applications of 0·06% Rogor. A wetting agent was used with DDT and parathion. At harvest time residues of the insecticides were either absent or were below 0·2 p.p.m.

7586. Oatman, E. R.
Walkingsticks: an unusual pest on sour cherry. *J. econ. Ent.*, 1965, **58**: 587-8, bibl. 1, illus.

Diapheromera femorata.

7587. Markelova, E. M.
Control of cicadas on apple trees. [Russian.] *Sadovodstvo*, 1965, No. 3, p. 27.

Recommendations for the control of *Edwardsiana* spp. include spraying with a 0·1% solution of parathion when the first adults appear and again 8–10 days later.

7588. Doutt, R. L., and Nakata, J.
Overwintering refuge of *Anagrus epos* (Hymenoptera: Mymaridae). *J. econ. Ent.*, 1965, **58**: 586.

Satisfactory biological control of the vine leafhopper, *Erythroneura elegantula*, by *Anagrus epos* was obtained when vineyards were surrounded by *Rubus* spp., on which the parasite was found to overwinter.—Univ. Calif., Berkeley.

7589. Olifer, A., and Bogdan, L.
The control of codling moth. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(5): 22-3.

In 4 years' trials of a number of compounds used for the control of *Enarmonia pomonella* the best results were obtained by scraping off the loose bark and spraying the trunks in the spring with a mixture of 8% mineral oil emulsion, 1% DNC, 0·1% parathion or Dipterex, and a 5% suspension of 12% BHC, followed by summer spraying with either 0·1% parathion or 0·2% Dipterex.

7590. Bengston, M.
Studies on codling moth control in the Stanthorpe district, Queensland. *Qd J. agric. Anim. Sci.*,* 1965, **22**: 59-68, bibl. 7, illus.

During the 1958-59 to 1962-63 seasons 9 trials were conducted to determine the value of new insecticides for the control of *Cydia pomonella* in apple orchards. The materials tested were azinphos-ethyl, azinphos-methyl, carbaryl, carbophenothion, DDT, dioxathion, ethion, lead arsenate, Mersurol and phosphamidon. Treatments were applied according to predetermined programmes for each season. DDT exercised satisfactory control in the 1958-59 trial, but there was a marked reduction in efficacy in subsequent trials. Azinphos-ethyl, azinphos-methyl, carbaryl and Mesurol were the better treatments in later trials and have been recommended. [From author's summary.] A phytotoxicity described as ring-marking was associated with the emulsifiable form of azinphos-ethyl.—Qd Dep. prim. Ind.

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* Formerly *Qd. J. agric. Sci.*

7591. PROVERBS, M. D.
The sterile male technique for codling moth control. *West. Fruit Gr*, 1965, **19**(4): 19-20, illus.

In a small-scale trial in apple orchards the degree of fruit infestation was initially reduced to 5% from 90% by insecticidal sprays, following which the release of sterile males in subsequent years resulted in 7%, 0·5% and finally 0·05% infestation, in spite of re-infestation from neighbouring orchards. In a further trial, using a more rapid method of sterilization in the moth stage, the release of a mixture of both sterile male and sterile female moths in an orchard reduced infestation from 60% to less than 2%. [See also *H.A.*, 33: 2795 and 2796.]—Summerland Res. Stat., B.C.

7592. MESCH, H.
Erfahrungen mit Lichtfallen für den Warndienst. **(Experiences with light traps for the warning service.)** [English and Russian summaries ⅙ p. each.] *Beitr. Ent.*, 1965, **15**: 139-55, bibl. 28, illus.

A slightly modified form of the Minnesota light trap, with HQA 125W and HQL 250W mercury vapour lamps and a killing bottle containing carbon tetrachloride, proved highly effective for use in connection with a warning service against codling moths and for the study of certain other apple pests.

7593. MINISTRY OF AGRICULTURE, LONDON.
Small ermine moths. *Adv. Leafl. Minist. Agric., Lond.*, **40**, revised 1965, pp. 3, illus.

Control of the moths *Yponomeuta padella*, *Y. malinella*, *Y. cognatella* and *Y. rorella* on fruit trees and ornamentals by chemicals and hand picking.

7594. ANON.
I minatori del melo. **(Apple leaf miners.)** *Progr. agric., Bologna*, 1965, **11**: 747-8, illus.

Including brief recommendations on the control of *Lithocolletis blancardella*, *Leucoptera* (*Cemiostoma*) *scitella* and *Nepticula* spp.

7595. GOHELAŠVILI, R.
The fruit leaf miner. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(4): 51; and *Sadovodstvo*, 1965, No. 3, p. 24.

The parasites *Apanteles circumscriptus* and *Sympiesis* sp. reduced populations of *Lithocolletis torminella* on apple trees by 25–35%. Good chemical control of the caterpillars was obtained by spraying with 0·2% parathion emulsion, 0·1% Intrathion emulsion or 0·3% anabasine sulphate+soap.

7596. ANTONGIOVANNI, E., AND SIDDI, G.
Mezzi di lotta contro la *Zeuzera pirina*. **(Control measures against *Zeuzera pyrina*.)** *Progr. agric., Bologna*, 1965, **11**: 545-9, illus.

Leopard moth infestation of apple trees was reduced by 98% as a result of 7 applications, between early June and early September, of Phosdrin at 0·04% a.i. At the same concentration Carposan was almost as effective, and both Cidial and Rogor gave over 90% control. Carposan and Cidial each had the advantage of being effective against codling moths.

7597. MONASTERO, S.
La *Zeuzera pyrina*: nuovo metodo di lotta. **(A new method of controlling *Zeuzera pyrina*.)** *Inf. fitopat.*, 1965, **15**: 157.

Leopard moth (*Zeuzera pyrina*) infestations of apple, pear, quince and walnut trees were almost perfectly controlled by a single application in late July of 0·1% Fitofos 50 or 0·4% Didifos 50.

7598. EDLAND, T.
Rognebærmøll (*Argyresthia conjugella* Zell.). **(The service berry moth.)** *Gartneryrket*, 1965, **55**: 430, 433-4, 436, bibl. 10, illus.

The life history of the pest is described. In years when there are not many service berries (its natural host) apple fruits are attacked. In preliminary experiments on control neither malathion nor parathion was effective in a single application. DDT gave some control, but the best results were obtained with azinphos-methyl or a mixture of DDT and diazinon. Application in July gave better results than earlier spraying.—St. Plantevern, Vollebekk.

7599. ANON.
Le tignole del pesco. **(Peach moths.)** *Progr. agric., Bologna*, 1965, **11**: 554-5, illus.

A brief review, including current control measures against *Cydia molesta* and *Anarsia lineatella.*

7600. POST, G. R., DIBBLE, J. E., AND RETAN, A. H.
Fruit moth findings may help *this* year. *West. Fruit Gr*, 1965, **19**(5): 26-7, illus.

In a spray timing trial 2 sprays (at the appearance of any 2 of the first 3 caterpillar broods) adequately controlled the oriental fruit moth [*Cydia molesta*] on peaches. Guthion and Sevin gave the best control of a number of insecticides tested.

7601. WEAVER, G. M., AND BOYCE, H. R.
Preliminary evidence of host resistance to the peach tree borer, *Sanninoidea exitiosa*. *Canad. J. Plant Sci.*, 1965, **45**: 293-4, bibl. 1.

A survey of peach seedlings, representing 23 progenies of self-pollinated or hybrid combinations, showed that the degree of infestation by *S. exitiosa* was inversely related to winter tenderness. Exceptions to this were some inbred progenies of Goldray, Elberta, Dixired and Golden Jubilee, in which a low infestation was associated with tolerance of low winter temperatures.—Canada Dep. Agric., Harrow, Ont.

7602. RAINE, J.
Control of *Dasystoma salicellum*, a new pest of blueberries in British Colombia. *Canad. J. Plant Sci.*, 1965, **45**: 243-5, bibl. 1.

Pre-blossom sprays were not effective against this leafroller because plots were re-infested by first-instar larvae blown in from wild host plants nearby. Single post-blossom sprays of phosphamidon, TDE, mevinphos, malathion, carbaryl and Perthane, and 3 sprays of Thuricide (*Bacillus thuringiensis*), were all effective. Malathion is recommended. Several non-chemical methods of control are discussed. [From author's abstract.]—Canada Dep. Agric., Vancouver, B.C.

7603. DICKER, G. H. L.
Control of the bramble shoot webber, *Notocelia uddmanniana* (L.) (*Tortricidae*), by azinphos-methyl. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 165-6, bibl. 1, illus.

A single application of 0·03% azinphos-methyl applied to loganberries on 10 (bud-burst), 19 or 30 April, 1962, resulted in the survival, respectively, of 0·1, 0·4 and 0·7 larvae per bush compared with 2·2 on unsprayed bushes. In 1964 an application of 0·03%, 0·02% or 0·01% at bud-burst resulted, respectively, in 0·6, 0·4 and 0·5 larvae per bush, with 4·1 on unsprayed bushes.

From these results it is concluded that 0·015% azinphos-methyl at bud-burst should give satisfactory control under commercial conditions. [Author's abstract.]

7604. Jensen, F. L., Stafford, E. M., and Kidd, H. **Non chemical control gains.** *West. Fruit Gr*, 1965, **19**(4): 34-5.

Bacillus thuringiensis preparations proved nearly as effective for the control of grape leaf folder [*Desmia funeralis*] as the standard insecticides, without affecting the natural predators.—Univ. Calif.

7605. Trentini, R.
Nuovo tortricide della vite in provincia di Trento. **(A new vine tortrix moth in Trento province.)** *Inf. fitopat.*, 1965, **15**: 160-1, illus.

Argyrotaenia pulchellana is reported as a serious pest on vines, particularly of the varieties Pinot grigio, Pinot bianco, Teroldego and Tokai. Of the 3 generations produced annually the last, appearing early in August, is the most harmful. Vineyards sprayed in late July or early August with either Sevin or DDVP produced undamaged fruit, even where the pest was abundant in adjacent vineyards.

7606. Smith, E. H.
The susceptibility of life history stages of the pear psylla to oil treatment. *J. econ. Ent.*, 1965, **58**: 456-64, bibl. 11.

Adults and nymphs of pear psylla, *Psylla pyricola*, were killed by direct contact with oil emulsions well below the standard concentrations used in practice. The residue caused a striking reduction in oviposition for an extended period after treatment. Control under field conditions was probably due chiefly to kill of adults by direct treatment. Under field conditions an oil with a viscosity of 60 sec. was as effective as those with viscosities of up to 405 sec. Possibilities for more effective use of highly refined, light oils are discussed. [From author's abstract.]—N.Y. St. agric. Exp. Stat., Geneva.

7607. Morgan, C. V. G., and Arrand, J. C.
Identification and control of the San José scale and the European fruit scale in the Okanagan Valley. *Publ. B.C. Dep. Agric.*, **65-8**, 1965, pp. 12, illus.

A comparison is made between the distribution, host range and damage caused by the 2 scales. Recommended sprays and methods of application are listed.

7608. Ahmedov, D. A., and B'jadovskij, G. S.
Wofatox exterminates San José scale. [Russian.] *Sadovodstvo*, 1965, No. 3, p. 19.

Wofatox (a mixture of parathion and methyl parathion) applied as an 8% suspension in the autumn and the following spring, and as a 4% suspension in late June and early August, gave good control of the scale in orchards. Dusting with a 3% Wofatox dust was also effective.

Chemicals and their application.

(*See also* 6938, 6944, 7478, 7519, 7528, 7533, 7545, 7549.)

7609. Johnson, J.
The use of certain soil fumigants and nematocides as pre- and post-plant treatments on peach and plum trees. From abstr. in *Phytopathology*, 1965, **55**: 499.

Ethylene dibromide (EDB) at 10, 15 and 20 gal./acre and 1,3-dichloropropene (Telone) at 30 gal./acre were applied 3 weeks prior to planting. Phenyl *N,N*-dimethylphosphorodiamidate (Nellite) at 2, 4 and 6 lb./acre was applied 1 week after planting. After 1 season's growth trees treated with EDB at 10 gal./acre had the highest rate of survival. In another trial methyl bromide (Dowfume MC-2) at 2 lb./100 sq. ft., chloropicrin (Picfume) at 3 ml./sq. ft. and a mixture of 80% 1,3-dichloropropene, 15% chloropicrin and 5% propargyl bromide were applied 4 and 2 weeks prior to planting. Half of the plots were aerated 72 hours after treatment and the remaining plots were covered until planting. Chloropicrin-treated trees gave the most uniform results.—Texas A. & M. Univ., Coll. Station.

7610. Gratwick, M.
Laboratory studies of the relative toxicities of orchard insecticides to predatory insects. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 171-6, bibl. 18.

Eleven insecticidal sprays were tested in the laboratory for toxicity to active stages of at least 3 species of predatory insect by directly spraying the insects or by exposing them continuously to dried deposits on apple leaves. The sprays were DDT/BHC, DDT emulsion, DDT wettable powder, DDD, carbaryl, azinphos-methyl, demeton-methyl, dimethoate, mevinphos, lead arsenate and ryania. All were tested at the highest concentrations recommended for the orchard, and some also at lower concentrations, on a mirid (*Psallus ambiguus* or *Blepharidopterus angulatus*), an anthocorid (*Anthocoris nemorum*) and one or two coccinellid species (*Propylea 14-punctata*, *Adalia bipunctata*). Lead arsenate and ryania were the only insecticides tested that were relatively innocuous to these predators, but, in this country [the U.K.], they give only moderate control of the pest (codling moth) against which they are used. The chlorinated hydrocarbons, particularly DDT, were generally less toxic than the organophosphorus compounds to the anthocorid and one of the coccinellids, but more toxic to the mirids. The carbamate and the organophosphorus compounds were generally very toxic to all the species studied, but demeton-methyl was rather less toxic than the others of the latter group and, as a deposit, slower in its effect. [Author's abstract. For related work see *H.A.*, 34: 6652.]

7611. Vagt, W.
Der augenblickliche Stand der Bienengefährlichkeit der von uns empfohlenen Schädlingsbekämpfungsmittel. **(The present position with regard to danger to bees from pest control materials recommended by us.)** *Mitt. ObstbVersuchsringes, Jork*, 1965, **20**: 133-4.

All the fungicides and acaricides recommended for use in orchards are harmless to bees, and all the insecticides injurious. The situation regarding other materials, such as herbicides, thinning sprays and browsing preventives, depends in general on their composition and season of use.

7612. Schäfer, H.
Blütenspritzungen im Obstbau. **(Blossom spraying in fruit growing.)** *Schweiz. Z. Obst- u. Weinb.*, 1965, **101**: 258-63.

Investigations on organic-fungicide and wettable-sulphur sprays were conducted in 30 apple orchards in 1964. The sprays had no toxic or repellent effects on bees and did not contaminate nectar. Their effects on flower fertilization and fruit number were studied in 7 varieties. The total number of flower clusters in the control, the organic-fungicide and the wettable-sulphur plots were 3,328, 2,545 and 2,409, respectively. The corresponding numbers of fruits were 1,447 (43·5% of the number of clusters), 1,556 (61·1%) and 1,515 (62·8%). The percentages of malformed fruits were 1·5, 2·3 and 2·0 in Boskoop, 2·2, 1·9 and 2·5 in Cox and 10·8, 7·5 and 9·3 in Jonathan. The mean number of sound seeds per fruit were 0·9, 1·4 and 1·9 in Boskoop, 4·5, 4·6 and 4·4 in Cox and 4·4, 4·4 and 5·7 in Jonathan.—Eidg. Versuchsanst., Liebefeld.

7613. Liebster, G.
Ergebnis 2jähriger Untersuchungen über den Einfluss mehrerer während der Blüte ausgebrachter Fungizide auf Junifruchtfall und Fruchtbehang beim Apfel. **(The results of 2-year trials on the influence of several fungicides, applied during blossoming, on the June drop and fruit set of apples.)** [English summary ⅓ p.] *Z. PflKrankh.*, 1965, **72**: 325-44, bibl. 24, illus.

Thirteen fungicides were tested on the apple varieties Golden Delicious, Cox's Orange Pippin, Jonathan, James Grieve, Ingrid Marie and Goldparmäne. The percentage fruit set and fruit drop were not significantly affected by the fungicide applications, although there were significant differences between varietal responses. —Inst. Obstb. tech. Hochsch., München, Freising-Weihenstephan.

7614. Oetzmann, H.
Der Einfluss von Quecksilber und einigen anderen Fungiziden auf den Fruchtansatz. **(The effect of mercurial and some other fungicides on fruit set.)** *Mitt. ObstbVersuchsringes, Jork*, 1965, **20**: 163-72, bibl. 1, illus.

The effects of fungicidal sprays on young leaves and on fruit set in Cox were investigated in 1962 and 1963. In a preliminary experiment involving the removal of leaves from fruiting shoots by hand before flowering the percentages of fruit set with 6–8, 3–5, 1–4 and no young leaves per shoot were 15·9, 13·3, 12·1 and 4·8, the mean fruit sizes were 61·0, 60·2, 59·5 and 55·8 mm. and the yields were 1,400, 1,350, 1,231 and 522 g. per 100 flowers. The mean lengths of young leaves in the unsprayed control and with 0·05, 0·1 and 0·2% mercurial sprays were 43·0, 33·5, 28·1, 25·7 mm.; with 0·4% mercurial sprays the young leaves were so deformed as to be unmeasurable. The percentages of fruit set with different fungicidal treatments were: unsprayed—17·9, Orthocide 83—15·9, Orthocide plus Karathane—12·9, 0·4% organic mercury—7·5, 0·4% organic mercury plus Karathane—9·7, 0·4% organic mercury plus wettable sulphur—12·9, and bordeaux mixture—12·2. The corresponding yields in g. per 100 flowers were 1,663, 1,400, 1,151, 692, 1,032, 1,211 and 1,062. In another experiment the fruit sets obtained with 0·2, 0·1 and 0·05% organic mercury were 24·8, 8·8 and 0·9% less than that obtained with 0·15% Orthocide 83; the corresponding figures for yield in g. per 100 flowers were 21·9, 13·5 and 0·5.

7615. Kirby, A. H. M., and Bennett, M.
The absence of a conditioning effect towards fungicides in certain apple varieties. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 184-90, bibl. 2.

The phytotoxic effects of 15 fungicide programmes were studied for 5 years on 2 apple varieties, Cox's Orange Pippin and Worcester Pearmain, and for 2 years on a third variety, Laxton's Superb, all on M.VII rootstock. There was no evidence from these trials to support the view than pre-blossom applications of phytotoxic fungicides, such as lime-sulphur or phenylmercuric chloride (PMC), could condition the tree for post-blossom applications. On Cox, and to a lesser extent on the other 2 varieties, post-blossom application of lime-sulphur was harmful, regardless of the pre-blossom treatments. On Cox programmes containing PMC, applied pre-blossom and/or post-blossom, reduced fruit set, "mature" fruit and picked crop more than did those containing lime-sulphur or colloidal sulphur. In one season only, PMC applied at pink-bud caused leaf scorch and splitting of fruiting spurs. Lime-sulphur, and even more so PMC, increased russeting on this variety; however, where lime-sulphur was used pre-blossom followed by captan post-blossom, fruit set and cropping were at least as good as where captan was used throughout. On Worcester programmes containing PMC post-blossom were more harmful than those containing it pre-blossom, except that in which colloidal sulphur was used post-blossom. All pre-blossom sprays tended to cause side russet, lime-sulphur more so than PMC. On Laxton's Superb lime-sulphur pre-blossom led to poorer set and cropping than PMC pre-blossom, except where the latter was followed by lime-sulphur post-blossom, which was the most damaging programme of all. [Authors' abstract.]

7616. Sirois, D., Hilborn, M. T., and Cooper, G. R.
Influence of certain fungicides on apparent photosynthesis of an entire apple tree. *Bull. Me agric. Exp. Stat.* **629**, 1964, pp. 18, bibl. 32, illus.

A mature apple tree was enclosed within an inflated plastic air-house, and its rate of CO_2 assimilation was measured by infra-red gas analysis. After spraying the test tree with a given fungicide the CO_2 assimilation rate was measured along with measurements of light intensity and atmospheric CO_2 concentration. By substituting these values in a regression equation a predicted value for the assimilation rate was obtained. A comparison of the predicted rate with the actual rate enabled the actual rate to be expressed as a percentage. Results indicated that the organic fungicides Niacide M and glyodin and inorganic sulphur fungicides reduced the rate of CO_2 assimilation of an entire apple tree. Reduction due to the sulphur fungicides persisted much longer than that due to the organic fungicides. After an initial suppression period following spraying with elemental sulphur the rate of assimilation of the tree returned to the rate achieved prior to spraying. After a brief suppression period both Niacide M and glyodin sprays resulted in assimilation rates higher than the original rate present before spraying, with glyodin causing the greatest increase. The data suggest that the increased yield of trees sprayed with organic fungicides in comparison with those sprayed with elemental sulphur fungicides may be due to either a greater detrimental effect on assimilation by the sulphur fungicides, to a stimulatory effect of the organic fungicides on assimilation, or to a combined effect of both factors. [From authors' summary].

7617. Lehoczky, J.
Fungicid szerek hatása a szőlőlevelek zöld-, szárazanyag súlyára és össz-klorofill tartalmára. **(The effect of fungicides on the fresh and dry weights and the total chlorophyll content of vine leaves.)** [English and Russian summaries 2 pp. each.] *Kísérl. Közlem., Sect. C* 1964 (issued 1965), **57C**(1): 73-85, bibl. 17.

In 2 years' trials on the Great Hungarian Plain the vine variety Furmint was sprayed 6 times between 22 May and 26 July with 0·5% Miltox (20% zineb+37% copper oxychloride), 0·2% Tiezene (zineb), 0·3% Orthocide (captan) and 1% bordeaux. All the treatments, except Orthocide, increased the fresh and dry weights and the chlorophyll content of the leaves compared with the controls. Tiezene gave the best results in all respects, and the foliage treated with it remained bright green and free of scorch even during very hot, dry weather. The sequence of leaf fall, starting in mid-September, was Orthocide, control, Miltox, bordeaux and Tiezene. Miltox caused mild, and Orthocide more severe, yellowing of the foliage.

7618. van Zanten, J.
Praktijk-bespuitingsproef. **(A field spraying trial.)** *Fruitteelt*, 1965, **55**: 535.

Two spray programmes were compared for 5 apple varieties growing on M.IV, M.VII and M.IX rootstocks. Scheme A incorporated Aaventa, captan, Morestan and Urbazid (Tuzet); Scheme B incorporated Aaventa, Aastimulan, Karathane and Aateck. Trees were examined for foliage cover, mildew infection and symptoms of mineral deficiencies. Where Urbazid was used, russeting of Golden Delicious fruit was considerably reduced. Apples from trees on M.IV were less russeted than those from trees on M.VII or M.IX. Four applications of Aastimulan (Scheme B) corrected Mn and Mg deficiencies and prevented leaf fall, whereas with Scheme A Mn deficiency resulted in reduced foliage cover. A combination of Aastimulan and Urbazid is recommended to prevent leaf fall and russeting.—N.F.O., Utrecht.

7619. Kirby, A. H. M., and Bennett, M.
"Kelthane" russet of apples and its avoidance. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 191-5, bibl. 5.

Some methods intended to avoid the russeting of Cox's Orange Pippin fruits, observed in trials of commercial acaricides based on dicofol applied at petal-fall, were tested. No mitigation was achieved by adding cottonseed oil at the rate used to reduce leaf damage by bordeaux mixture on cherries, nor by adding captan 50% w.p. at the recommended rate for apple scab control. Changing the formulation of the technical dicofol led to greater russeting, but purification led to much less severe russeting. The use of concentrate sprays at very low volume avoided russet by either grade of dicofol and by either formulation. [Authors' abstract.]

7620. Lawver, K. E., and Hartz, R. E.
Effect of sprays on quality factors of raw red tart cherries.
Hartz, R. E., and Lawver, K. [E.].
The effect of sprays on quality factors of canned red tart cherries. *Food Technol.*, 1965, **19**(3): 100-103, bibl. 14; 103-5, bibl. 10.

First paper: The effects of actidione, ferbam-sulphur and copper sprays were studied on Montmorency cherries harvested over a period of about 4 weeks, the intervals between pickings being based on the heat units accumulated after full bloom. Compared with copper sprays actidione increased the yield by about 15% and reduced defects significantly, but retarded maturation and resulted in a lower soluble solids content. The ferbam-sulphur treatment gave intermediate results. With copper-sprayed fruit harvesting could be started after 750–800 heat units, above a base of 55° F., had accumulated, whereas actidione-sprayed fruits required an accumulation of 900 units. *Second paper*: In the case of canned fruit the drained-weight of copper-sprayed cherries was 1% higher than that of cherries sprayed with actidione or ferbam-sulphur. Both the firmness and the defects of the canned fruit increased as harvest was delayed. Actidione-sprayed and copper-sprayed fruits were generally of better colour than ferbam-sulphur-sprayed fruits.—Pet Milk Co., Biglerville, Pa.

7621. Szkolnik, M., and others.
Mercury residue of apple fruit as related to application schedules and to the colorimetric and the neutron activation analyses. *Plant Dis. Reptr*, 1965, **49**: 568-70, bibl. 5.

Pre-cover applications of phenylmercuric acetate fungicide in the form of Tag at ¼ pint per 100 gal. of spray may result in a very slight residue of mercury at the time of harvest. Low levels of mercury residue were determined in fruit from trees that had received no mercury sprays for 10 or more years. A realistic low-level tolerance for mercury in apples would seem to be in order. [From authors' abstract.]—N.Y. agric. Exp. Stat., Geneva and Ithaca.

7622. Koivistoinen, P., Vanhanen, L., and Koskinen, E. H.
Disappearance of malathion residues from gooseberries at different residue levels. *J. agric. Food Chem.*, 1965, **13**: 344-6, bibl. 14.

Post-harvest applications of P^{32}-labelled malathion at different initial deposit levels were made on gooseberries, which were then stored at 22° to 25° C. The berries were analysed after 3 and 7 days of storage, and the distribution patterns of malathion-P^{32} into chloroform-soluble, water-soluble and inextractable fractions, as well as the loss from the berries, were determined. In the 7-day pattern, which was, except for the lowest residue level, essentially the same as the 3-day pattern, the proportion of the P^{32}-activity in the chloroform fraction was 31% at an initial deposit level of 2·2 p.p.m., 44% at a 130-p.p.m. level, 85% at a 330-p.p.m. level and 95% at a 1,802-p.p.m. level. The amounts of malathion-P^{32} found in the water fractions varied from 59% at the lowest to 3% at the highest residue level. The actual figures in malathion equivalents for the four application levels were 1·1, 51, 38 and 38 p.p.m., indicating the presence in gooseberries of a malathion-degrading enzyme system with a limited capacity. The amounts of radioactivity not extractable from the berry solids to either the chloroform or water fractions varied from 10% at the lowest to 2% at the highest level. Of the initial loads of radioactivity 14% to 23% was not recovered. [From authors' abstract.]—Univ. Helsinki, Finland.

7623. Byass, J. B., and Charlton, G. K.
Spraying techniques for orchards of standard trees. *J. agric. Engng Res.*, 1965, **10**: 60-9, bibl. 9, illus.

A comparison was made between conventional high-volume spray application by automatic air-carrier sprayer and (i) half the volume of spray at the same concentration but with improved wetting properties and (ii) the same active chemical applied at 25× normal concentration. The work was done in an [apple] orchard of large dense trees to determine whether either of the new techniques offered a more economical method of spraying old orchards of culinary varieties by saving, respectively, chemical or application time. Measurements of spray deposition and insect, mite and fungus control indicated that all treatments gave poor results high in the trees. The treatment employing a reduced amount of chemical had serious failings. Scab control was good using lime-sulphur in high concentration, and application time was reduced to one third, but mite control by ovicide was inadequate. [Authors' summary. See also *H.A.*, 34: 678.]—N.I.A.E., Silsoe, Beds.

7624. Moore, M. H., and Bennett, M.
A field comparison of fungicides as concentrate sprays on apples. *A.R. E. Malling Res. Stat. 1964*, 1965, **A48**: 158-64, bibl. 4.

Spray concentrates, based largely on wettable-powder preparations, were applied to small, replicated plots of dwarf-pyramid apple trees at pre-determined quantities of chemical per acre based on recommended rates for high-volume spraying. A captan/DNOPC mixture was clearedly superior to the other sprays tested as regards yield and skin finish of Cox's Orange Pippin. Lime-sulphur and mixtures of DNOPC with thiram or dodine acetate, which gave the best scab control on the fruit, each displayed relative disadvantages, but lime-sulphur and the thiram mixture gave slightly better mildew control than the other treatments. James Grieve proved less responsive than Cox to treatment differences, but was adversely affected by the thiram mixture. A wettable sulphur/mercury preparation gave good control of scab and mildew on Bramley's Seedling in view of the limited programme of sprays. The mercury preparation alone was almost as effective as the mixture against scab, but much less effective against mildew; sulphur sprays, including lime-sulphur, gave the best mildew control but damaged Newton Wonder. In contrast, the crop of Bramley's Seedling was unaffected by any of the treatments. [Authors' abstract. For earlier work see *H.A.*, 34: 4537.]

7625. Graves, C. H., Jr.
Pecan disease control by aerial application. *Miss. Fm Res.*, 1965, **28**(4): 3, 8, illus.

In a 1-year trial helicopters compared favourably with fixed-wing aircraft for scab and brown leaf spot control in pecans, and aerial application techniques consistently gave results at least as good as those obtained by conventional ground application methods. Cyprex, when applied as an aerial dust, did not provide such effective control of pecan diseases as when applied as an aerial spray. Nozzle sizes, spray pressures, aircraft speed and swath width are discussed.

VEGETABLES, TEMPERATE, TROPICAL AND GLASSHOUSE.

General.

7626. Wellesbourne.
Fifteenth Annual Report of the National Vegetable Research Station, Wellesbourne, 1964, 1965, pp. 95, bibls, 8s. 6d.

Reports on current research include the following: *Plant breeding*, pp. 21-7: Work on lettuces, parsnips, brussels sprouts, spring cabbages, cauliflowers, *Phaseolus* beans and spinach. *Chemistry*, pp. 28-33: Fertility—spacing—irrigation—variety experiments on cauliflowers and onions; manurial trials on onions, summer cabbage, red beet, spring cabbage, beans, brussels sprouts, lettuce and cauliflowers; mineral nutrition of vegetable seedlings; the effect of soil pH on the uptake of micronutrients by peas; the effect of FYM on micronutrients in vegetables; Fe metabolism of plants; and studies on O_2 transport from the leaves to the roots of vegetable seedlings. *Biochemistry*, pp. 34-5: The role of K in vegetable nutrition. *Plant physiology*, pp. 36-46: The effects of spacial arrangements on yields of peas, parsnips and brussels sprouts; the effects of sowing date on plant establishment, earliness and quality in 4 carrot varieties; internal browning of brussels sprouts; manurial effects on carrot, red beet and french bean seed yields; the use of a desiccant for red beet seed crops; factors affecting seed performance including seed size and maturity, and parent plant nutrition; the relative efficiency of different glazing materials for propagating brussels sprouts; carrot root shape studies; and studies on onion skin colour and keeping quality. *Irrigation*, pp. 47-59: Trials on peas, cabbage, lettuce and broad beans; effects of mineral-free water on water uptake and transpiration in tomato and lettuce plants; experiments with petroleum mulch; factors affecting the set of runner bean pods; and cultural and developmental studies on summer and autumn cauliflowers. *Entomology*, pp. 60-7: Natural and chemical control of the cabbage root fly; insecticide residues in carrots; and control of lettuce root aphid, carrot fly and carrot-willow aphid. *Plant pathology*, pp. 68-72: Studies on parsnip canker (*Centrospora* spp.), clubroot of brassicas, downy mildew (*Bremia lactucae*) of lettuce, carrot motley dwarf disease, rhubarb virus diseases, big-vein disease of lettuce, *Septoria* blight of celery, leaf blight (*Alternaria dauci*) and black rot (*Stemphylium radicinum*) of carrots and *Fusarium* wilt of runner beans. *Weed investigations*, pp. 73-5: Weed seed population studies; and herbicide trials in peas, beans, onions and red beet. *Statistics*, pp. 76-81: Inter-plant effects in regularly spaced crops; effects of an irregularly arranged crop on carrot root diameter; and yield-maturity relationship in peas.

7627. Alkmaar.
Jaarverslag 1964 van het Proefstation voor de Groenteteelt in de Vollegrond in Nederland. **(Annual Report 1964 of the Experiment Station for Vegetable Growing in the Open in the Netherlands)**, 1965, pp. 144, illus.

Work reported includes the following investigations: *Soil nutrition and water economy*, pp. 29-38: Soil water tables and their effects on endive, spinach, leek, red cabbage, chicory and french bean; N uptake by beetroot and endive; irrigation of french bean and iris; improving soil structure with various organic materials and the effects on winter cauliflower; organic manures for dune sand; and the application of compost to asparagus. *Breeding*, pp. 41-6: Asparagus and bean. *Cultural and variety trials*, pp. 49-98: With endive, asparagus, gherkin, celery, cauliflower, bean, celeriac, swede, beetroot, parsnip, leek, shallot, lettuce, cabbage, spinach, brussels sprouts, broad bean, chicory and carrot. *Mechanization and work study*, pp. 101-8: Machines for picking brussels sprouts, precision sowing, washing and lifting chicory; and work studies with chicory and asparagus. *Diseases and pests*, pp. 111-22: Of cabbage, chicory, onion, carrot and lettuce; and control of eelworms and soil fungi. *Chemical control of weeds*, pp. 125-36: In chives, cauliflower, bean, chervil, celeriac, beetroot, parsnip, parsley, leek, scorzonera, celery, lettuce, spinach, brussels sprouts, broad bean, chicory and root crops.

7628. Ontario Department of Agriculture.
Ontario vegetable production recommendations. *Publ. Ont. Dep. Agric.* **263**, 1965, pp. 31, illus.
Varieties and culture of 26 common vegetable crops are briefly discussed, together with recommended weed, disease and insect control measures.

7629. Fundación Shell, Venezuela.
Hortalizas. IIa edición. **(Vegetables. Second edition.)** [*Publ.*] *Serv. Shell Agric., Venezuela*, **A25**, 1964, pp. 115, illus.
Advice is given on the culture of garlic, eggplant, onion, cauliflower, cabbage, lettuce, melon, cucumber, watermelon, capsicum, red beet, tomato, *Phaseolus* bean and carrot.

7630. Mareček, F., and Truksa, V.
Plocha, produkce, výnosy a rozmístění hlavních druhů zeleniny v ČSSR v letech 1946-1962. **(The area, production, yields and distribution of the most important vegetables in Czechoslovakia during the years 1946-1962.)** [English, Russian and German summaries ½ p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 9-21, bibl. 3.
Details are given of the commercial production of 17 vegetables. Features include a decline in cabbage growing and expanded cultivation of peppers, peas, cauliflowers, celeriac and tomatoes.

7631. Jørgensen, M. B.
Aktuelle resultater og problemer indenfor dansk køkkenurtdyrkning. **(Recent results and the problems in Danish vegetable growing.)**
Lamm, R.
Aktuella resultat och problem inom svensk köksväxtodling. **(Recent results and problems in Swedish vegetable growing.)**
Persson, A. R.
Aktuelle resultater og problemer i grønsakdyrkinga i Norge. **(Recent results and problems in vegetable growing in Norway.)** *Nord. Jordbr-Forsk.*, 1964, Suppl. 8, pp. 254-6; 256-61, bibl. 16; 261-5.

7632. Schoppers, A. J.
Kiest uw herfstteelt met overleg. **(Choose your autumn crop with forethought.)** *Groent. en Fruit*, 1965, **20**: 2253.
Labour requirements and average monetary returns over 3 years are compared for autumn crops of cucumbers, tomatoes, lettuces and chrysanthemums under glass. In most years tomatoes gave the best results in terms of returns per man-hour.—R.T.C., Naaldwijk.

7633. Nath, P.
Breeding for insect resistance in vegetable crops. *Indian J. Hort.*, 1964, **21**: 206-12, bibl. 30.
A review.

7634. Statens Planteavlsudvalg og Faellesudvalget for Prøvedyrkning af Køkkenurter, and Statens Forsøgsvirksomhed i Plantekultur.
Anerkendte sorter og stammer af køkkenurter, 1965. **(Approved varieties and strains of vegetables, 1965.)** [English summary 1 p.] [*Publ.*] *St. Planteavlskont. Faellesudv. Prøvedyrk. Køkkenurter København*, [1965], pp. 16.
Approved varieties are listed, and tests with cauliflowers, carrots, cabbages, radishes, brussels sprouts, lettuces and spinach are tabulated.

7635. Odland, M. L., Noll, C. J., and Runner, M. H.
1964 vegetable variety trials. *Progr. Rep. Pa agric. Exp. Stat.* **256**, 1965, pp. 6.
Including capsicum, tomato and pumpkin.

7636. Singh, H. B., Bhagchandani, P. M., and Thakur, M. R.
Vegetable seed production in Kulu valley. V. Summer vegetables. *Indian J. Hort.*, 1964, **21**: 221-31.
Advice on the growing of seed crops of tomato, eggplant, capsicum, french bean, okra, cucumber and squash. [For part IV see *H.A.*, 34: 688.]—Veg. Breed. Substat., Katrain.

7637. Wiebosch, W. A.
Jarowisatie bij enige groente—en aanverwante gewassen. **(Jarovization with some vegetables and related crops.)** [English and German summaries 3 pp. each.] *Meded. Proefstat. Groent. Alkmaar* **30**, 1965, pp. 129, bibl. 199, illus.
Jarovization is defined here as the method first developed by Lysenko for wheat, by which seeds are soaked, chilled and then exposed to low temperatures in order to reduce the time between sowing and flowering in the field. Vernalization is defined as the effect of low temperatures on flower initiation. The methods and effects of jarovization are described for several crops including beetroot, kohl-rabi, endive, chervil, swedes, radishes (black and red), corn salad, witloof chicory and carrots. In almost all cases the treatment did not markedly advance flowering; in beetroot, however, which has a low vernalization requirement, uniform early bolting was induced in one variety following 60–65 days' treatment at 1·5° C. before sowing in March. In some cases jarovization induced more vigorous vegetative growth, particularly just before bolting occurred, although the actual amount of foliage produced was slightly less than in untreated plants. The recommended conditions for jarovization are tabulated for each crop.

7638. Cristali, G., Nistor, N., and Popescu, T.
Contribuţii la mecanizarea semănatului culturilor legumicole. **(A contribution on the mechanized sowing of vegetables.)** *Grăd. Via Liv.*, 1965, **14**(4): 17-27, illus.
Comparison of seeding machines.

7639. Fukala, E., and Chmela, V.
Předpěstování sadby v rašelinových kořenáčích. **(Seedling production in peat pots.)** [English, Russian and German summaries 8 lines each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 195-209, bibl. 7, illus.
Lettuce, cabbage, tomato and capsicum seedlings were raised in peat, Jiffy and clay pots and in soil blocks,

and the lettuce seedlings were also pricked out. The peat pots produced high yields of early maturing crops at the lowest cost.

7640. STORCHSCHNABEL, G.
Versuche mit Topfkulturen. **(Experiments with crops grown in pots.)** [English summary 6 lines.] *Bodenkultur*, 1965, **16**: 9-17, bibl. 9, illus.

In preliminary experiments lettuces suffered severely and kohl-rabi only slightly from restriction of root space. Lettuces in 12-cm. pots produced top yields 68% greater than those in 9-cm. pots, whereas kohl-rabi in 9-cm. pots were only 13% less in diameter than those in 12-cm. pots. In further experiments the pots used contained a number of holes near the base. The pots were filled with a 2 : 1 soil : peat mixture and sunk in ground peat on trays (carrying individual pots or groups of pots) to such a depth that roots growing horizontally out of the holes lay at about half the depth of the peat substrate. A 0·3% nutrient solution was supplied. After 64 days lettuces had produced heads with a mean weight of 320 g. compared with 140–150 g. in the controls. Good results were also obtained with tomatoes, capsicums and dwarf beans.—Inst. PflBau PflZucht., Wien.

7641. VLČEK, F., AND POLÁCH, J.
Pěstování zelenin bez půdy. I. Srovnávací pokusy hydroponie s běžným způsobem pěstování. **(Vegetable growing without soil. I. Comparative experiments on hydroponic and ordinary methods of cultivation.)** [English, Russian and German summaries ½ p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 23-45, bibl. 29, illus.

Over a 4-year period several crops of kohl-rabi, cucumber and radish were grown on 4 media with a nutrient solution and also in soil. On average, soilless cultivation resulted in slightly higher yields and earlier maturity. No significant differences were observed in the nutritive values of the crops grown by the 2 methods. In a study on seedling production for soilless cultivation kohl-rabi seedlings raised in soilless culture gave higher and earlier yields than those raised in soil. Crushed basalt with or without an admixture of peat was a more suitable substrate than river sand with or without peat.

7642. VLČEK, F., AND POLÁCH, J.
Hydroponie zelenin—koncentrace živných roztoků. **(Soilless culture of vegetables—the concentration of nutrient solutions.)** [Russian and German summaries ½ p. each.] *Rostlinná Výroba*, 1965, **11**: 17-24, bibl. 6, illus.

In gravel-culture experiments with radishes, peppers and kohl-rabi better results were obtained with a 0·2% nutrient solution than with 0·1, 0·3 or 0·4% solutions. Increasing the N level in the nutrient solution by 50% increased the yields. The utilization of nutrients from the solution was higher at lower concentrations and was also affected by the nutrient ratio of the solution. [For peppers see also *H.A.*, 34: 2965.]

7643. VLČEK, F., AND POLÁCH, J.
Poměr živin v živném roztoku při hydroponii zeleniny. Předběžné sdělení. **(The ratio of nutrients in the nutrient solution used for growing vegetables in soilless culture. Preliminary communication.)** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 163-74, bibl. 7, illus.

An N : P : K ratio of 1 : 0·55 : 1·78 produced more vigorous pepper plants and greater yields of fruit with a higher ascorbic acid content than a ratio of 1 : 0·74 : 2·38. Tests with kohl-rabi and radishes gave similar results. [See also *H.A.*, 34: 2965.]

7644. WINTER, E. J.
Some effects of wind upon vegetable crop plants. *Sci. Hort., 1964-65*, [1965], **17**: 53-60, bibl. 9, illus.

Field experiments indicated that the growth of lettuce and cabbage plants could be adversely affected by wind of moderate intensity, and that yields might be increased by suitable sheltering. In wind-tunnel experiments with peas exposure to wind during the 12-hour light period had a greater retarding effect on growth than exposure during darkness. With tomatoes the rate of water loss from the plants during the dark period was one-third of that during the light period, even under conditions of near calm; the water loss from sheltered plants was always more than that from plants exposed to wind. These results are explained on the assumption that wind causes the stomata to close.—Nat. Veg. Res. Stat., Wellesbourne, Warwick.

7645. ŞTEFAN, N.
Protejarea culturilor de legume. **(Protecting vegetable crops.)** *Grăd. Via Liv.*, 1964, **14**(5): 10-13, illus.

Advice on various methods of frost protection in Romania.

7646. (BRILL, G. D., ALDERFER, R. B., AND HANNA, W. J.).
Minimum tillage . . . for vegetables? *Agric. Res., Wash.*, 1965, **13**(12): 15-16.

Cabbage—tomato—corn rotations on minimum-tilled plots of sandy soil gave substantially the same yields, over a 6-year-period, as those on conventionally-tilled plots. Under simulated rainfall the former showed 50% less run-off than the latter. Mulch-tilled plots had less run-off but smaller yields than conventionally-tilled plots.—N.J. agric. Exp. Stat., New Brunswick.

7647. WILSON, J. D., AND HEDDEN, O. K.
Liquid mulches. *Ohio Rep. Res. Dev.*, 1965, **50**: 3-5, illus.

A short account is given of trials with various liquid preparations. Methods and rates of application are given and the advantages of liquid mulching discussed. Asphalt mulch applied at 600 gal./acre following soil treatment with Vapam or allyl alcohol increased the stand of tomatoes and lowered the weed count. Liquid mulching with asphalt or wax preparations caused higher soil temperatures. Liquid mulching of cucumbers resulted in earlier flowering and a 100% yield increase over unmulched crops.

7648. KRAUS, R.
Beregnungstechnik im Gartenbau. **(Irrigation techniques in horticulture.)** *Dtsche Gärtnerbörse*, 1965, **65**: 317-20, illus.

By using irrigation higher yields were obtained with savoys, white cabbages, brussels sprouts, tomatoes and celery. Irrigation combined with N applications (250 kg. N/ha.) was more beneficial to savoys and white cabbages than to brussels sprouts. Costs, calculation of irrigation needs, the use of stationary or mobile apparatus and types of irrigation are discussed.—Bayer. Landesanst. Wein-, Obst- u. Gartenb., Würzburg-Veitshöchheim.

7649. Cselőtei, L.
A zöldségnövények vízhasznosítása. **(The water utilization of vegetable crops.)** [English and Russian summaries 1 p. each.] *Agrártud. Egyet. mezőgtud. Kar. Közlem., Gödöllő, 1964*, 1964, pp. 201-26, bibl. 20, illus.

Transpiration and water consumption coefficients were determined from 80 experiments conducted over 10 years with a large number of vegetables grown in specially constructed pots for consumption or for seed. The mean value for the transpiration coefficient was about 300, and the transpiration : evaporation ratio was 2 : 1. The water consumption coefficient was about ⅓ of the transpiration coefficient and was higher in summer-planted than in spring-planted vegetables. In plants grown for seed, with their relatively low weight of crop yield, the water consumption coefficients were very high. The values of both coefficients within individual varieties depended mainly on environmental factors; values were usually lower when growing conditions were favourable. Variations between the values for individual plants grown under similar conditions, however, were mainly due to differences in crop : total plant weight ratios.

7650. van Staalduine, D., and Verlaat, J. G.
Ontwikkeling van de chemische onkruidbestrijding in de groenteelt in Nederland. **(Development of chemical weed control in vegetable growing in Holland.)** [English summary ⅓ p.] *Meded. Dir. Tuinb.*, 1965, **28**: 270-8, bibl. 8, illus.

A survey of the methods and compounds used, with particular reference to carrots, lettuce and endive under glass.

7651. Rocco, D. M.
The use of soil-applied herbicides in horticultural crops. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 4.

A preliminary account is given of trials with herbicides in vegetables grown for export to European markets. Linuron at 1–1·5 lb./acre, Aresin [monolinuron] at 1 lb./acre and desmetryne at 0·75 lb./acre were applied from a tractor-mounted Hypro pump in 70 gal. water. Linuron controlled weeds other than *Malva verticillata*, *Cyperus* sp. and *Cynodon dactylon* when applied pre-emergence in beans. Aresin was dependent on climatic conditions. Desmetryne was ineffective pre-emergence and scorched the crops when applied post-emergence. When used with the stale seed-bed technique, however, it controlled all weeds. Good to excellent control was obtained with post-emergence application in leeks, carrots, onions and cauliflowers, but there was some twisting of onion foliage; avoidance of scorch to cauliflowers depended on the crop being at least 1 ft. high. Desmetryne or linuron pre-planting or granular herbicides showed promise in capsicums.—Dominio di Doriano Est., Naivasha, Kenya.—From *Weed Abstr.*, **14**, No. 71.

7652. Janýška, A.
Předběžné výsledky se zkoušením nových herbicidů v kulturách zelenin. **(Preliminary results of testing new herbicides in vegetable crops.)** *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 185-90, bibl. 2.

The herbicides tested were A 1114 (50% prometryne) at 1 to 4 kg./ha. and Alipur (16% OMU+11% BiPC) at 3 and 4·5 l./ha. A1114 gave excellent weed control, and when applied at 4 kg./ha. immediately after sowing parsley, peas, beans and kale and after planting garlic did not cause yield reductions. Cabbage tolerated only 1·5 kg./ha. applied after sowing or at the 5-true-leaf stage. Kohl-rabi was injured by as little as 1 kg./ha. Tomato yields were not affected significantly by rates of 1, 2 or 3 kg./ha. applied immediately before planting out, but the highest rate retarded ripening. Alipur gave good weed control in spinach without significantly affecting yields.

7653. Janýška, A., and Toul, V.
Použití herbicidů v kulturách zeleniny a jejich vliv na výnosy a některé biochemické složky. I. Gesagard 50 (uč. l. prometryn) v kulturách kořenovin a luskovin. **(The use of herbicides in vegetable crops and their effect on yields and some biochemical components. I. Gesagard 50 (prometryne) in root crops and legumes.)** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 93-103, bibl. 6.

Yields were increased with Gesagard 50 (50% prometryne) applied pre-emergence at 1–2·5 kg./ha. in carrots, parsley, parsnips, peas and beans, and applied at 2–3 kg./ha. before sowing celeriac and to growing carrots and celeriac. Apart from increasing the β-carotene in carrots and slightly reducing the dry matter content of beans Gesagard 50 had little effect on the composition of the crops studied.

7654. Boyce, W. R.
Weed control in lettuce, celery and tomatoes at Levin—1961 to 1963. *Proc. 16th N.Z. Weed Control Conf., 1963*, pp. 50-4.

Winter lettuce: Chlorpropham at 2 lb./acre, CDEC at 3 lb./acre and chlorpropham at 1 lb. plus CDEC at 3 lb./acre, applied in May, 1 day before transplanting, did not significantly affect yields and gave weed control similar to that obtained on hand-weeded plots. Other herbicides used in post-emergence screening trials did not appear to have any advantage over CDEC or chlorpropham. *Celery*: In trials in which herbicides were applied in January, 1 day after planting out, propazine at 1·5 lb./acre gave very good weed control until harvest. In a screening trial the highest celery yields were obtained with propazine applied at 0·75 lb./acre 1 day before planting and solan at 6 lb./acre 12 days after planting. *Dwarf tomatoes*: In a preliminary post-emergence evaluation trial ipazine at 1·5 lb./acre and 2 applications of solan at 3 lb./acre resulted in yields equal to those obtained on hand-weeded controls. Information is also given on the degree of weed control and the crop's reaction to a number of other herbicides. [For results with french beans, carrots and cauliflowers see *H.A.*, 34: 694.]—Hort. Res. Stat., Levin, N.Z.—From *Weed Abstr.*, **14**: No. 73.

7655. Ministry of Agriculture, London.
Injury to glasshouse crops by TBA residues in straw manure. *S.T.L. Minist. Agric., Lond.*, **34**, 1964, pp. 5.

Symptoms in tomato and cucumber, and remedial measures.

7656. Andras, S., and Ferenc, T.
The influence of monoculture on the yield of vegetables. [Hungarian.] *Publ. Acad. Horti-Viticulturae*, 1964, **28**(1): 27-46, from abstr. in *Informationsdienst Weihenstephan*, 1965, No. 6, p. 85.

Crop rotation led to higher average yields of capsicums and tomatoes than monoculture. This applied also to cabbage when supplied with FYM plus mineral fertilizers, but monoculture produced slightly better results when inorganic fertilizers alone were used. FYM plus minerals was better for capsicums than inorganic fertilizers alone, but the type of manurial treatment only slightly affected tomato yields.

7657. Geissler, T., Drews, M., and Kaufmann, H.-G.
Grundsätze für eine rationelle Mineraldüngung im Gemüsebau. I. Einstufung der Nährstoffanalysenwerte von Böden und Erden. **(Principles of rational mineral fertilization in vegetable growing. I. Evaluating the nutrient analyses of soils and composts.)**
Gründsatze für eine rationelle Mineraldüngung im Gemüsebau unter Glas. II. Höhe der Mineraldüngergaben im Gemüsebau unter Glas. **(Principles of rational mineral fertilization in vegetable growing under glass. II. Level of the mineral fertilizer applications in vegetable growing under glass.)** *Dtsche Gartenb.*, 1965, **12**: 114-16, bibl. 8; and 157-9, bibl. 10.

The soils and composts were divided into 3 groups based on excess, optimal and insufficient nutrient contents. Tabulated data are presented for the application of N, P and K to specific vegetables grown for early, medium and late production under each of the 3 soil and compost conditions.—Inst. Gemüseb. Grossbeeren, Humboldt Univ. Berlin.

7658. Capitaine, R. C.
Recommandation sur l'emploi des engrais en Tunisie. **(Recommendations for the use of fertilizers in Tunisia.)** *Docums tech. Inst. nat. Rech. agron. Tunisie* 7, 1965, pp. 10.

Including irrigated crops of citrus, melons and tomatoes.

7659. Wacquant, C.
Aspects économiques de l'utilisation du gaz carbonique dans les serres en culture maraîchère. **(Economic aspects of the use of carbon dioxide in glasshouses in market gardening.)** *Rev. hort., Paris*, 1965, **137**: 879-81.

Work on the use of supplementary CO_2 in the growing of cucumbers, tomatoes and lettuce is reviewed. The cost of CO_2 treatment of lettuce grown under glass from October to December, using propane as the gas source, is examined in detail. Suggested economies include improving the air-tightness of the glasshouse and reducing or stopping the gas supply on very dark days. Depending on the length of the growing period, CO_2 may be supplied for 30–65 days at a cost of 2–8 centimes per lettuce or slightly more when using paraffin as the gas source. It is concluded that the technique is economically justifiable during seasons in which light and CO_2 are limiting factors in an otherwise well-managed culture.—Inst. nat. Vulg. Fruits, Légumes et Champignons.

7660. Salokangas, K.
Om inverkan av växthusluftens CO_2-halt på grönsaker. **(The effect of the CO_2 level in the glasshouse atmosphere on vegetables.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, p. 266.

At Piikkiö, Finland, increases in lettuce yields with atmospheric concentrations of CO_2 three times the normal were 60% in September/October and 40% in February/March. Higher CO_2 concentrations during seedling production had a greater effect on tomatoes than on cucumbers, although the growth of both was accelerated. Plants given extra light in addition to CO_2 developed most quickly.

7661. Balvoll, G.
Klorhaldig gjødsel i grønsakproduksjonen. **(Chloride-containing fertilizers in vegetable production.)** *Gartneryrket*, 1965, **55**: 509-10, bibl. 7.

The advantages and disadvantages of using chloride-containing or sulphate-containing fertilizers for vegetables are discussed. Vegetable crops are grouped according to their ability to tolerate chlorides.

7662. Bernstein, L.
Salt tolerance of plants. *Agric. Inf. Bull. U.S. Dep. Agric.* **283**, 1964, pp. 23, illus.

Information is included on the salt tolerance of safflower [see *H.A.*, 35: 1771], spinach, tomato, broccoli, cabbage, lettuce, capsicum, onion, carrot and beans, and on salinity control. [For shrubs suitable for saline soil see *H.A.*, 33: 7658.]

7663. Osawa, T.
Studies on the salt tolerance of vegetable crops with special reference to mineral nutrition. [Japanese, with English summary 3 pp.] *Bull. Univ. Osaka Pref., Ser. B*, 1965, **16**: 13-57, bibl. 91.

Nineteen vegetable species (including strawberry) were grown in sand culture and supplied with a basic nutrient solution containing various concentrations of NaCl. The relative salt tolerances of the crops are tabulated. Cruciferous vegetables were generally more tolerant than leguminous and other fruit vegetables. The mechanism of salt injury was investigated; the inhibition of plant growth by excess salt was attributed chiefly to osmotic effects. The effects of supplying N in ammonium and nitrate forms were studied. NO_3-N resulted in better plant growth both in the absence and presence of salt. NH_4-N in the absence of salt caused toxicity symptoms; in the presence of salt it caused various malnutrition symptoms, notably Ca deficiency in tomato, cucumber and Chinese cabbage. Foliar sprays of Ca were more efficient than increased Ca in the nutrient solutions in correcting Ca deficiency under saline conditions. Methods of diagnosing salt injury are described.

7664. Vančura, V., and Hovadík, A.
Root exudates of plants. II. Composition of root exudates of some vegetables. *Plant and Soil*, 1965, **22**: 21-32, bibl. 7, illus.

Quantitative and qualitative differences are reported in the composition of the root exudates of 6 plants from 4 families, including cucumber, turnip cabbage (*B. oleracea* var. *gongylodes*), tomato and red pepper, in the initial stages of growth, and for the last 2 species also at the fruiting stage. It is concluded that the less the plants are related phylogenetically, the greater is the difference in the composition of the exudates. These results are discussed in relation to certain aspects of the rhizosphere effect. [Authors' summary.]—Czech. Acad. Sci., Prague, and Veg. Res. Inst., Olomouc.

7665. Costes, C.
Biosynthèse des caroténoïdes à partir d'acétate 2-^{14}C par différents organes non chlorophylliens. **(Carotenoid biosynthesis from 2-C^{14} acetate in various non-chlorophyllous organs.)** [English summary ½ p.] *Ann. Physiol. vég.*, 1965, **7**: 25-40, bibl. 23.

Sodium $2\text{-}C^{14}$ acetate was used as the labelled precursor for various carotenoid biosyntheses, and the extraction, separation and purification of the pigments are described. The compounds studied were phytofluene, lutein and α-, β- and ζ-carotene in carrot root; phytofluene, ζ-carotene, lycopene, lycophyll and lutein in ripe tomato fruit; and β-carotene, cryptoxanthin and zeaxanthin in the fruit calyx of *Physalis franchetii.* The results confirmed the hypothesis of Porter and Lincoln on the sequence of the biosynthesis of lycopene from phytofluene, and indicated that 2 different methods existed in nature for the biosynthesis of xanthophylls.—Cent. nat. Rech. agron., Versailles.

7666. Curtis, C. R.
Effects of ultrasonics on plants and disease development. From abstr. in *Phytopathology*, 1964, **54**: 891.

Under controlled temperature conditions (20°±2° C.) short insonation periods at 40 kc./sec. and relatively low intensity did not significantly affect the germination of seeds of Pinto beans, okra, peas, tomatoes, watermelon and lettuce. At the same intensity, however, root length of germinated cucumber seeds was significantly inhibited by exposures of 1, 3, 5 and 7 min. Cucumber and bean plants grown hydroponically had a marked decrease in taproot length and an increase in number of lateral roots if treated for 2 min. twice daily for 14 days. Plants grown in the centre of the treatment vessel were affected more than those near the outside. This suggests an unequal energy distribution with more activity in the centre. Insonation reduced the germination of *Fusarium solani* macroconidia. Carnation cuttings carrying macroconidia of *Fusarium roseum* externally were insonated at the higher intensity for 5 and 10 min. After 3 weeks in the propagation bench symptoms of *Fusarium* stem rot were more severe on treated cuttings. These experiments indicate that inoculum density of pathogens may be reduced with proper ultrasonic treatments, but the host plant may become more susceptible.—Colo. St. Univ., Fort Collins.

7667. Messiaen, C.-M., and Lafon, R.
Les Maladies des Plantes Maraîchères. Volume II. **(Diseases of Market Garden Plants. Volume II.)** Inst. nat. Rech. agron., Paris, 1965, 9½×6½ in., pp. 331, bibls, illus., 26 F.

The crops dealt with in this volume are *Allium* spp. (garlic, shallots, onions and leeks), asparagus, carrots, brassicas and other cruciferous crops (including radishes and watercress), spinach, lettuce and chicory, globe artichokes and cardoons, beet and Swiss chard, and salsify and scorzonera. The final chapter gives an annotated alphabetical list of the fungi causing diseases of vegetables, including where possible brief notes on their control. The index covers both volumes. The high standard of production of volume I [see *H.A.*, 34: 706] is maintained.

7668. Davis, D.
Cross-protection of *Fusarium* wilt suscepts with eight formae specialis of *Fusarium oxysporum*. From abstr. in *Phytopathology*, 1964, **54**: 891.

Cabbage, carnation, tomato and watermelon seedlings, grown individually under light on inorganic nutrient agar in test tubes, were inoculated singly (i.e. only one f. sp./tube) with the following formae specialis of *F. oxysporum*: *vasinfectum*, *batatas*, *tracheiphilum*, *conglutinans* race 1, *dianthi*, *lycopersici*, *niveum* and *lini*. Seven days later the tubes containing the seedlings were re-inoculated with f. sp. *conglutinans* race 1, *dianthi*, *lycoperisci*, *niveum* and *lini*, respectively. The controls showed severe disease symptoms 10 days after inoculation, whereas symptoms in the re-inoculated plants were either delayed or failed to appear within 4 weeks. Re-inoculation by transfer of inoculated plants to freshly inoculated agar also retarded the disease. Histological examination indicated that cross-infection was common, the non-pathogens penetrating the root a few mm. from the point of inoculation.—N.Y. bot. Garden, Bronx.

7669. Brett, C. H., and others.
Vegetable insect control. *Leafl. N.C. agric. Ext. Serv.* **102**, 1965, pp. 16, illus.

Recommended applications of sprays and dusts for the control of common insect pests of 22 vegetable crops are tabulated. Pest-resistant varieties of snapbean, tomato, squash, cucumber, watermelon and crucifers are briefly discussed.

7670. Byers, M., and Sturrock, J. W.
The yields of leaf protein extracted by large-scale processing of various crops. *J. Sci. Food Agric.*, 1965, **16**: 341-55, bibl. 12.

Including mustard, marrow, pea, kale and nasturtium.

Artichokes.

(*See also* 6901, 6910.)

7671. Tabin, S.
Porównanie produkcyjności i jakości kilkunastu form różnego pochodzenia bulwy (*Helianthus tuberosus* L.). **(A comparison of productivity and quality in several forms of Jerusalem artichoke from different sources.)** [English and Russian summaries 1 p. each.] *Roczn. Nauk rol., Ser. A*, 1964, **89**: 581-643, bibl. 35, illus.

Results of 3 years' trials with 13 forms.

7672. Martelli, G. P.
L'arricciamento maculato del carciofo (*Cynara scolymus* L.). **(Mottled crinkle of artichokes, *Cynara scolymus*.)** *Phytopath. medit.*, 1965, **4**: 58-60, bibl. 5, illus.

The virus responsible is apparently neither curly dwarf, reported from California, nor yellow mosaic, present in Sicily and Apulia.

7673. Michail, S. H., Abd-el-Rehi, M. A., and Elarosi, H.
Artichoke seed-piece decay. *Phytopath. medit.*, 1965, **4**: 56-7, bibl. 17, illus.

Diplodia musae, previously found on banana and pear fruits, caused serious losses in globe artichoke stands in Egypt through the infection of portions of rhizome used for vegetative propagation. In most cases rapid disintegration was caused by *Aerobacter aerogenes* invading the tissues attacked by the fungus.—Univ. Alexandria.

Asparagus.

7674. Konvička, O.
Příspěvek k poznání citlivosti chřestu (*Asparagus officinalis* L.) a galtonie (*Galtonia candicans* L.) vůči záření gama. **(The sensitivity of asparagus and *Galtonia* to gamma radiation.)** [English and Russian summaries ⅓ p. each.] *Rostlinná Výroba*, 1965, **11**: 181-8, bibl. 5, illus.

Dry asparagus and *Galtonia* seeds were irradiated with gamma rays at dosages of from 2 to 100 kr. Increasing the dosage caused a slight progressive reduction in the germinating percentage of asparagus but did not affect that of *Galtonia*. The speed of germination was also reduced in asparagus but raised in *Galtonia*. Higher dosages inhibited root and axial growth in asparagus. At 40 kr. the axial part in asparagus did not form, and, after planting out, field survival was below 1%. The LD_{50} for asparagus was about 30 kr. and the LD_{80} 35–40 kr. [For earlier work see *H.A.*, 34: 1966.]

7675. VAN ASSCHE, C., AND VAN DEN BROECK, H. Fusariose van de asperges: verhouding tussen zaadherkomst, bodeminfectie, zaaddesinfectie, kieming en kiemplantontwikkeling. **(Asparagus foot-rot: the relationship between the seed source, soil infection, disinfection of the seed and seedling development.)** [French, English and German summaries ½ p. each.] *Meded. LandbHogesch. Gent*, 1964, **29**: 867-74.

The disease was normally associated with *Fusarium oxysporum*. Seedling sensitivity to fungal attack varied considerably within the same field. Seed disinfection with ethyl mercury bromide (0·79% Hg) helped to prevent damage, although there was usually some phytotoxicity and the germination percentage was reduced slightly. [For earlier work see *H.A.*, 34: 2686 and 2687.]—Lab. PlZiekt., Univ. Leuven.

7676. APELAND, J. Kvalitet av grøn asparges og faktorar som verkar på denne etter hausting. **(The quality of green asparagus and factors affecting it after harvesting.)** *Gartneryrket*, 1965, **55**: 437-8, bibl. 3, illus.

Recommendations for maintaining quality from harvesting to marketing, based on American research.

Brassicas—varieties, culture, physiology and marketing.

(*See also* 6908, 6965, 7961, 8033.)

7677. MCLEOD, C. C. **Brassica manuring trials in South Canterbury.** *N.Z. J. Agric.*, 1965, **110**: 114-15, 119, 122, illus.

Phosphatic fertilizers gave good yield increases in chou moellier, kale, swede and soft turnip at all localities and on all soil types. Applications of N and K appeared to be of no advantage. The effects of S and Mo on certain crops were also noted.

7678. MINISTRY OF AGRICULTURE, LONDON. **Brussels sprouts.** *Adv. Leafl. Minist. Agric., Lond.*, **299**, 1964, pp. 6.

Advice on soils, varieties, culture, weed control, harvesting and marketing.

7679. SHARMA, B. R., AND SWARUP, V. **Correlation studies and the use of selection indices in the F_2 population of an intervarietal cross of cabbage.** *Indian J. Hort.*, 1964, **21**: 213-20, bibl. 21.

In general, the genotypic correlation coefficients were higher than the phenotypic. Maturity was observed to be positively correlated phenotypically with net weight and shape index, and negatively with compactness. The gross weight of head was positively correlated with net weight and number of non-wrapper leaves, and negatively with shape index both phenotypically and genotypically. Net weight of head was negatively correlated with shape index as well as with number of non-wrapper leaves phenotypically. The highest genetic advance in net weight of head was brought about when selection was based on lower number of non-wrapper leaves. A marked increase in net weight was also obtained when a lower shape index was used for selection. The discriminant function technique was adopted for the construction of 20 suitable selection indices for selection of net weight of head. The results indicated that among individual characters used for selection the number of non-wrapper leaves showed a higher efficiency than that of net weight of head alone. [From authors' summary.]—Indian agric. Res. Inst., Delhi.

7680. KONVIČKA, O. Mutace zelí (*Brassica oleracea* L. var. *capitata*) bez voskového náletu (ojínění) a její využití. **(A cabbage mutant without waxy coating (bloom) and its use.)** [English and Russian summaries 8 lines each.] *Rostlinná Výroba*, 1965, **11**: 189-94, bibl. 5.

The mutant is low yielding and unsuitable for cultivation, but on account of its high ascorbic acid content it shows promise for breeding and could also be used in hybrid seed production.

7681. LUŽNÝ, J., AND MORAVEC, J. Zhodnocení sortimentu červeného hlávkového zelí (*Brassica oleracea* L. var. *capitata* L. f. *rubra* DC.). **(The evaluation of various red cabbage varieties.)** [English, Russian and German summaries ⅓ p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 129-45, bibl. 15, illus.

The synonyms and origin are given and the morphological and economic characteristics briefly described of red cabbage varieties classified into early, medium early, medium late and late types. The highest purity, best yields and greatest uniformity were shown by varieties of Danish and Dutch origin.

7682. BUISHAND, T. Mogelijkheden voor groene kool? **(Possibilities for green cabbage?)** *Groent. en Fruit*, 1965, **20**: 2025, illus.

For fresh consumption, the dark green Hammer types (for autumn) and Winterkoning and Ijsbeer (for winter) are probably the most suitable. These are planted up to the end of June. For storing, the light green Winterkoning and similar varieties are recommended and should be planted in early July.

7683. CALCATIN, N. Contribuţii la studiul comportării principalelor soiuri de varză timpurie. **(A contribution to the study of the behaviour of the main varieties of early cabbage.)** [French and Russian summaries ⅓ p. each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 265-9, bibl. 7.

In these trials the variety Ditmark outyielded the standard variety Prima Recoltă by 12·6% and was also appreciably earlier.

7684. NORDBY, A., AND HOLMØY, R. Plantemaskiner i kåldyrkingen. **(Planting machines for cabbage crops.)** *Gartneryrket*, 1965, **55**: 505-7, illus.

Work at the Norwegian Institute of Agricultural Engineering on methods and equipment used in cabbage planting is summarized and its practical significance discussed.

7685. Kohn, H., and Levitt, J.
Frost hardiness studies on cabbage grown under controlled conditions. *Plant Physiol.*, 1965, **40**: 476-80, bibl. 3.

Cabbage seedlings (var. Badger Market) were grown in growth chambers (25° C. day, 15° night) and hardened for 6 weeks at successively lower temperatures from 5° to −3°. The maximum hardiness attained was a frost-killing point of −20°, as opposed to a maximum of −7 to −10° for greenhouse grown plants hardened at 3°. Frost hardiness was related directly to photoperiod (8, 12, 18, 24 hr.) up to the end of the first week of hardening, but inversely from the end of the second week and for the next 2 to 4 weeks. Growth characteristics such as dry matter and morphological characters were correlated with hardiness only up to the end of the first week of hardening. Osmotic potential was correlated with hardiness at all photoperiods up to the end of the 3 to 6 weeks of hardening at 5° to 0°, during which lights were used, but not during the succeeding 3 to 6 weeks of hardening at −3° in the dark. [From authors' summary.]—Univ. Mo., Columbia.

7686. Marth, P. C.
Increased frost resistance by application of plant growth-retardant chemicals. *J. agric. Food Chem.*, 1965, **13**: 331-3, bibl. 21, illus.
Growth regulator protects cabbages at temperatures as low as 1° below zero. *Agric. Res., Wash.*, 1965, **13**(11): 10-11, illus.

Young cabbage plants were sprayed in the autumn with B-Nine or Cycocel and exposed during the winter to existing outdoor temperatures, the critical range being from 30° to −1° F. All of these plants survived, and 90% quickly resumed growth when brought into a warm greenhouse the following spring. In contrast, 40 to 60% of the control plants were killed by winter frost. In the spring the surviving control plants grew very slowly and the total amount of vegetative growth was greatly reduced. The number of plants that flowered in a late-maturing variety increased when B-Nine was applied at a low dosage of 625 p.p.m. However, at 2,500 and 5,000 p.p.m. flowering was suppressed and all the plants formed heads instead of flower stalks. [From author's abstract to first paper.] —U.S.D.A., Beltsville, Md.

7687. Marlow, H.
Chemische Unkrautbekämpfung in Kohl- und Kohlsamenträgerbeständen. **(Chemical weed control in cabbage and seed-cabbage crops.)** *Dtsche Gartenb.*, 1965, **12**: 159-62, illus.

Field tests of herbicides were carried out on cabbages in their first year, and on seed cabbages both overwintered and spring planted. Azaplant (amitrole), Azaplant-combination (amitrole and simazine), Omnidel (trichloropropionic acid) and Omnidel special (dalapon) were all unsuitable. Hedolit (DNOC) and Hedolit combined with W6658 (simazine) were the most satisfactory. [See also *H.A.*, 34: 2670.]—Dtsch. Akad. LandwirtWiss., Berlin.

7688. Payot, M.
La Sémérone. Un nouveau désherbant pour la culture maraîchère. **(Sémérone, a new herbicide for market gardening.)** *Rev. hort. Suisse*, 1965, **38**: 163-5, illus.

Two weeks after planting out red cabbage, Sémérone at 1·5 or 2·5 kg./ha. was applied to annual weeds at the 2–4-leaf stage. No later weeding was necessary. The yields were 357·5 and 350 kg./are, respectively, compared with a yield of 330 kg./are from a plot which had been weeded twice.

7689. Vlček, F., and Polách, J.
Přihnojování kapusty a zelí dusíkem. **(Top dressing savoys and cabbages with nitrogen.)** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 175-83, bibl. 8.

In 3 years' replicated trials P and K were broadcast in the spring, and after planting savoys and cabbages in May or June, Lovosice saltpetre was applied in 1, 2 or 3 doses. The highest savoy yields and best N utilization were obtained with 50 kg. N/ha. applied in 2 doses. The highest cabbage yields were produced by 75 kg. N/ha. in 3 doses. Application in the irrigation water was less effective for savoys than, but as effective for cabbages as, comparable rates of solid fertilizer.

7690. Petersdorff, H.
Untersuchungen über den rationellen Transport von Gemüse. **(Investigations into the rational transport of vegetables.)** *Dtsche Gartenb.*, 1965, **12**: 180-2, bibl. 2, illus.

The transport of white cabbages in pallet bins (wooden and wire) compared favourably with the use of boxes, especially in connection with highly mechanized harvesting. Loading onto railway trucks using a fork-lift took the least time of several methods studied and was only slightly more costly than loading by hand.—Hochsch. Landwirt. Bernburg.

7691. Ministry of Agriculture, London.
Cauliflowers and related crops. *Bull. Minist. Agric., Lond.*, **131**, 4th Edition, 1964, pp. 39, illus., 3s. 6d.

This bulletin includes a general chapter on growing cauliflowers, with tabulated data on varieties. The cultivation of summer, autumn and winter cauliflowers is then discussed, and this is followed by recommendations on the control of pests and diseases. Other crops mentioned are cape broccoli, sprouting broccoli and calabrese. Seed production and the warm water treatment of seeds are described in appendices.

7692. Watts, L. E.
Investigations into the breeding system of cauliflower. II. Adaptation of the system to inbreeding. *Euphytica*, 1965, **14**: 67-77, bibl. 12, illus.

In experiments to study the effect of inbreeding I_1 progenies of summer cauliflower showed a trend towards increase in plant weight over their non-inbred commercial parents. Curd quality, however, showed no significant improvement. As summer cauliflower varieties tended to behave as pure lines, studies were made on F_1's from crosses between 5 commercial varieties. The main results of hybridization were an increase in earliness, and a slight though significant increase in curd size over the parental varieties. It is suggested that summer cauliflowers have attained a state of homozygous balance which could be emulated in the autumn and winter types by selection of self-compatible individuals. [Author's abstract. For part I see *H.A.*, 34: 4666.]—Nat. Veg. Res. Stat., Wellesbourne, Warwick.

7663. Watts, L. E.
The inheritance of curding periods in early summer and autumn cauliflower. *Euphytica*, 1965, **14**: 83-90, bibl. 6.

Studies on 2 series of diallel crosses between 8 varieties of autumn cauliflower and 6 inbred lines from a single variety of early summer cauliflower.

7694. Priščep, L. G., and Kuzljakin, Ju. N.
Methods of electrically heating frames covered with film. [Russian.] *Izv. Timirjazev. sel'sk. Akad.*, 1965, No. 1, pp. 207-12, illus.

When cauliflower plants were grown in hotbeds covered with polythene film without additional heating, short-term frost of −3 to −5° C. caused a sharp reduction in yield. If the air was heated with an input rate of 60 to 70 W. per sq. m. these losses were avoided. The biggest yield was obtained with soil warming, but this method used more electricity than warming the air. Without a plastic film the yield was greatly reduced even though the soil was warmed. [See also *H.A.*, 34: 2121.]

7695. Kato, T.
On flower head formation and development in cauliflowers. I. Ecological studies on flower head formation and development. [Japanese, with English summary ½ p.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 316-26, bibl. 27, illus.

The highest yields in the varieties Early Snowball A, Nozaki-wase, Italian broccoli, Masuda-nakate and Masuda-bansei were obtained when there was vigorous vegetative growth for periods exceeding 95, 100, 100, 110 and 130 days, respectively, at average temperatures above 20° C. Phytotron trials showed that the time of flower bud initiation varied with temperature, plant size and variety. The larger the plant, the shorter was the chilling period required for flower bud differentiation. The optimum temperature for flower bud initiation, which was 13° for the variety Early Snowball A, was lower for medium and late varieties. Low temperature treatment for 10–15 days following bud initiation was necessary for normal head development. Shorter periods at low temperatures resulted in leafy heads. Seed vernalization promoted flower bud initiation when partially supplemented with plant vernalization in the varieties Sakata-gokuwase, Nozaki-wase and Italian broccoli.

7696. Barbier, S.
Untersuchungen an zwei Böden mit geringer Fruchtbarkeit. **(Investigations on two soils of low fertility.)** [English summary ⅓ p.] *Bodenkultur*, 1965, **16**: 25-40, bibl. 33, illus.

Cauliflower was one of the test crops used in fertilizer experiments in pots using a soil with inadequate contents of K, Mn and Cu, viz. 2·0 mg. K_2O, 2·30 mg. available Mn and 0·060 mg. available Cu per 100 g. soil. The relative yields with some of the different treatments (control = 100) were NP 134, NPK 262, NPK plus MnBCuZn 274.—Osterr. Stickstoffw. AG, Linz-Donau.

7697. Polách, J., and Janýška, A.
Nedostatok molybdénu u karfiolu. **(Molybdenum deficiency in cauliflowers.)** [English and Russian summaries ½ p. each.] *Pol'nohospodárstvo*, 1965, **11**: 85-90, bibl. 10.

In this abridged paper the results are given of several trials on preventing or controlling blindness in cauliflowers. A pre-planting soil application of ammonium molybdate at 3 kg./ha. completely prevented damage due to Mo deficiency. Plants showing Mo deficiency symptoms were practically cured by watering with 0·1% ammonium molybdate at the 5–7-true-leaf stage. [See also *H.A.*, 33: 5024 and 5025.]

7698. Lužný, J.
Některé poznatky při zušlecht'ování kedluben (*Brassica oleracea* L. var. *gongylodes*). **(Some findings made during the breeding of kohl-rabi.)** [English, Russian and German summaries ⅓ p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 171-83, bibl. 12, illus.

Kohl-rabi plants obtained from self-pollination in the buds (short-term inbreeding) did not bolt more than plants from open pollination. Raising seedlings under favourable conditions of temperature gave good results as regards bolting. Positive, though rather weak correlations were found between vigour, foliation and vitamin-C content and between vigour, foliation and sugar content.

7699. Lužný, J.
Prošetření sortimentu kedluben a F_1 generací s ohledem na vybíhavost. **(Testing different kohl-rabi varieties and F_1 generations with regard to bolting.)** [Russian and German summaries ⅓ p. each.] *Rostlinná Výroba*, 1965, **11**: 45-52, bibl. 7.

Of a large number of kohl-rabi varieties tested the Swiss types were distinguished by resistance to cold and to bolting. The use of a resistant variety as a parent, particularly as the female parent, increased the cold-resistance of the F_1 progeny.

7700. Troníčková, E.
Vliv skladování v teplotách pod nulou na životnost semen brukve a květáku. **(The effect of storage at sub-zero temperatures on the viability of kohl-rabi and cauliflower seeds.)** [Russian and German summaries ½ p. each.] *Rostlinná Výroba*, 1965, **11**: 25-34, bibl. 29, illus.

Kohl-rabi and cauliflower seeds stored at −20° C. for 5 years retained their original germination percentages, whereas the germination rate of seeds stored at 15–20° during the same period declined markedly. A storage temperature of −14° was found unsuitable, as during the first 4 years it gave poorer results than storage at 15–20°. Keeping the seeds for 3 months at normal temperature, after storage at −20°, did not reduce the germination percentage.

7701. Velička, O.
Vliv chybějících rostlin na výnos a způsob eliminace v polním pokusnictví u kedluben. **(The influence of missing plants on the yield and the method of eliminating this influence in field experiments with kohl-rabi.)** [English, Russian and German summaries ½ p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 109-27, bibl. 28.

In kohl-rabi the effect of gaps on the neighbouring plants depended on the evenness of the soil surface, on the spacing and on the cause and time of appearance of the gap. No varietal difference in response to gaps was noted and the effect was mainly confined to plants adjacent to the gap. In some cases the effect was negative, due, probably, to an unfavourable factor in the soil which caused the original gap. Analysis of covariance proved to be the most suitable method for correcting errors arising from the gaps. Adjustment by different methods gave similar results when 4–5% of the plants were missing. With 5–10% of plants missing the method should be chosen with care, and when over 10% of the plants are missing the results become useless.

7702. Duffek, J.
Některé možnosti posuzování agrotechnických opatření sledováním průběhu fotosyntézy. **(Possibilities of evaluating cultural practices by observations on the course of photosynthesis.)** [English, Russian and German summaries ¾ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 39-56, bibl. 19, illus.
Dynamika fotosyntézy v závislosti na vodním rezimu u některých druhů zelenin. **(The dynamics of photosynthesis in relation to the water regime in some vegetables.)** [Russian and German summaries ½ p. each.] *Rostlinná Výroba*, 1965, **11**: 3-16, bibl. 24, illus.

The highest rate of CO_2 assimilation was found in kohl-rabi plants grown with a water deficit of 14–16% and in tomatoes grown with a deficit of 11–19%. In kohl-rabi plants grown at a lower soil moisture level assimilation was most intensive at a light intensity of 0·7 cal./sq. cm./min. and at a temperature of 19° C., and in plants grown at a higher soil moisture level at 0·8 cal./sq. cm./min. and 21°. The corresponding values for tomatoes were 0·8 cal./sq. cm./min. and 24°, and 0·9 cal./sq. cm./min. and 26°, respectively. The practical implications of these results are discussed, and it is suggested that during warm sunny weather kohl-rabi and tomato plants should be grown at 75–80% soil moisture capacity, and in cool, cloudy weather at 60–65%.

7703. Hori, Y., and Aoki, M.
Studies on boron deficiency symptoms in vegetable crops. I. The effect of boron deficiency at various growth stages on growth and the development of deficiency symptoms in turnips. [Japanese, with English summary ⅔ p.] *Bull. hort. Res. Stat. Shizuoka, Ser. B (Okitsu)*, 1965, No. 4, pp. 93-106, bibl. 25, illus.

Plants were most susceptible to B deficiency at the 10–12-leaf stage when the root began to enlarge. Growth was retarded and the leaves became mottled after 2 weeks without B. Retarded root development and browning persisted, even when the supply of B was restored. The effects of B deficiency over a 2-week period were much less at earlier and later stages of growth. The concentration of B in the nutrient solution below which deficiency symptoms appeared was about 0·005 to 0·01 p.p.m.

7704. Primost, E.
Einzelfaktoren der Ertragsbildung und Bodenfruchtbarkeit. **(Crop production and soil fertility factors.)** [English summary ⅓ p.] *Z. PflErnähr. Düng.*, 1965, **108**: 144-56+summary, illus.

Including data on the total yield and the yield of digestible protein of 2 turnip varieties on a heavy soil.

Brassicas—diseases and pests.

7705. Brusse, M. J.
Glass-house and field observations on cauliflower and turnip mosaic viruses in relation to the breeding for virus tolerance. *N.Z. J. agric. Res.*, 1965, **8**: 672-80, bibl. 9, illus.

Evidence is presented suggesting that mixed infections of cauliflower and turnip mosaic viruses occur more frequently than single infections in turnip crops in Canterbury. Symptom expression of cauliflower and turnip mosaic viruses was studied in the glasshouse, mainly in relation to temperature effect. These glasshouse experiments and some field observations suggest that the conventional method of selection in the field is, as yet, the only one for the breeding of tolerance to virus diseases in brassicas. [Author's abstract.]—D.S.I.R., Lincoln.

7706. Godschalk, W., and Veldstra, H.
Investigations on turnip yellow mosaic virus interactions with aliphatic mercurials. I. *Arch. Biochem. Biophys.*, 1965, **111**: 161-73, bibl. 54, illus.

Degradation by low concentrations of simple aliphatic mercury compounds.

7707. Rao, Y. P., and Srivastava, D. N.
Epidemic of bacterial black rot disease of cauliflower at Katrain and measures for its prevention. *Indian J. Hort.*, 1964, **21**: 244-6, bibl. 3.

Recommendations for the production of seed free from black rot (*Xanthomonas campestris*) are seed treatment with hot water at 50° C. for 30 minutes, testing and treatment, if necessary, of the seeds of any cabbage which may be grown near cauliflower crops, the use of a nursery site where cauliflower and cabbage have not been grown for 2 years or sterilization of seed-beds with a formalin drench at least a month before sowing, maintaining at least a 2-year rotation, and immediate destruction of suspected plants in the nursery and in the field.—Indian agric. Res. Inst., New Delhi.

7708. Malekzadeh, F.
Evaluation of phenacridane chloride as a seed treatment for control of black rot of crucifers. *Plant Dis. Reptr*, 1965, **49**: 439, illus.

Phenacridane chloride was active against *Xanthomonas campestris* at concentrations as low as 25 p.p.m. No increases in antibacterial activity occurred at 4,000–5,000 p.p.m. Artificially inoculated seed was disinfected at 500 p.p.m. [See also *H.A.*, 34: 726.]

7709. Lammerink, J.
A survey of pathogenic races of clubroot in the South Island of New Zealand. *N.Z. J. agric. Res.*, 1965, **8**: 667-71, bibl. 4.

A glasshouse investigation of *Plasmodiophora brassicae* on several hosts, including turnips, showed that 4–5 races are present and suggested that new races arise which are pathogenic to varieties immune or resistant to existing races.—D.S.I.R., Lincoln.

7710. Ryder, H. W., and Crittenden, H. W.
Relationship of *Meloidogyne incognita acrita* and *Plasmodiophora brassicae* in cabbage roots. From abstr. in *Phytopathology*, 1965, **55**: 506.

Cabbage seed was planted in sandy-loam soil, which had been previously steam-sterilized, infested with either *Meloidogyne incognita acrita* or *Plasmodiophora brassicae*, or infested with both the nematode and the fungus, in clay pots in the greenhouse. Roots were sampled after 45 days' growth. The major area in the root used for evaluation was the lysigenoma in the tissue around the head of the nematode. The nematode had no apparent effect on the prevalence or appearance of the fungus in the roots. The fungus had no effect on the number of nematodes that invaded the roots, but had a marked effect on nematode development in the root. When the fungus was present, the lysigenomata were often occupied by the fungus and the nematodes seldom developed to maturity.—Univ. Del., Newark.

7711. CHANDLER, W. A.
Fungicidal control of anthracnose and white spot of turnip greens. *Plant Dis. Reptr*, 1965, **49**: 419-22, bibl. 5.

In small-scale field trials with a number of fungicides over several years maneb at 2–3 lb. per 100 gal. was consistently effective against anthracnose (*Colletotrichum higginsianum*) and white spot or pale spot (*Cercosporella brassicae*). Zineb at 2 lb. per 100 gal. was effective against anthracnose. Difolatan was effective against both diseases when used at a higher rate than maneb (3 lb.). Polyram was effective against white spot at 3 lb. Copper fungicides were injurious under certain conditions.—Ga Exp. Stat., Experiment.

7712. FELIX, E. L.
***Cercosporella* leaf spot-resistant radish greens.** From abstr. in *Phytopathology*, 1964, **54**: 892.

Introduced turnip strains were tested in the greenhouse for resistance to leaf spot, caused by *Cercosporella brassicae*. Primary inoculation consisted of spraying 3- to 4-leaf seedlings with conidia from 3-week-old cultures. Twenty-one turnip accessions showed moderate or severe leaf spot in both primary and secondary infections over a 2-month period. Two other strains proved highly resistant to leaf spot; they were *Barbarea verna* (winter-cress) from Afghanistan, which had a trace of leaf spot near the conclusion of the tests, and *Raphanus sativus* from Thailand, which showed a trace of leaf spot in primary infection and slight in secondary. This long, white radish had tender leaves of collard texture and flavour when cooked.—Tenn. agric. Exp. Stat., Knoxville.

7713. KAVANAGH, T., STAUNTON, W. P., AND RYAN, E. W.
Light leaf spot of brussels sprouts. *Irish J. agric. Res.*, 1965, **4**: 112-14, bibl. 5, illus.

In a severe outbreak of light leaf spot (*Gloeosporium concentricum*) the most direct loss was due to discoloration of the sprouts, and was made worse by delays in harvesting.—An Foras Talúntais, Kinsealy, Co. Dublin.

7714. MARRAS, F.
Il "mal dello sclerozio" (da *Sclerotinia minor* Jagger) del finocchio dolce e del cavolo cappuccio in Sardegna. **(Sclerotinia disease (*Sclerotinia minor*) of sweet fennel and cabbage in Sardinia.)** [English summary 10 lines.] *Note fitopat. Sardegna* **6**, 1963, pp. 7, bibl. 17, illus.

Disease symptoms are described. Some measure of control has been obtained with formulations based on PCNB.

7715. DAIBER, C. C.
Control insects on brassicas. *Fmg S. Afr.*, 1965, **41**(4): 29, 31.

Advice on the control of aphids, bagrada bugs and diamond-back moth.

7716. VAN EMDEN, H. F.
The effect of uncultivated land on the distribution of cabbage aphid (*Brevicoryne brassicae*) on an adjacent crop. *J. appl. Ecol.*, 1965, **2**: 171-96, bibl. 33, illus.

The numbers of *Brevicoryne brassicae* and its parasites and predators in a crop of brussels sprouts were counted during a season. The results were grouped so that the centre, 2 unsheltered edges and an edge of the field sheltered by trees could be compared to demonstrate the operation of edge-growth effects on a natural infestation of the aphid. The deposition of alate aphids was increased by shelter to windward, resulting in the heaviest initial infestation at the sheltered edge of the crop. The edge-growth crucifers became heavily infested at flowering, when numbers rose from less than 10 to 400 aphids per 90 plants within 2 weeks. Plants in unsheltered parts of the crop produced over 50 leaves during the season and carried more leaves than plants at the sheltered edge. Plants in this area produced on average only 38 leaves, which contained more water (87·2%) than the leaves of unsheltered plants (86·1%). The aphids at the sheltered edge reproduced more slowly than at the centre of the crop and appeared to suffer heavier mortality from rainfall, with the result that aphid numbers were about half those found at the centre of the crop. Losses of aphids caused by predation could be linked with the observed distribution of predators; aphids at the open edges suffered most from predation. [From author's summary.]—Univ. Reading.

7717. ADAŠKEVIČ, A.
Cabbage aphid. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(4): 44.

In trials for the control of *Brevicoryne brassicae* good results were obtained with Metaphos dust and with the following systemic organophosphorus compounds: a 0·15% suspension of Sajfos, a 0·15% emulsion of phosphamidon and a 0·2% emulsion of Gusathion.

7718. COAKER, T. H.
The effect of irrigation on the yield of cauliflower and cabbage crops damaged by the cabbage root fly. *Plant Path.*, 1965, **14**: 75-82, bibl. 7.

A comparison was made of the yield responses to different soil moisture regimes of early summer cauliflower and summer cabbage crops exposed to different levels of cabbage root fly (*Hylemyia brassicae*) infestation. Irrigation treatments gave the largest yield responses on plants kept free of damage throughout growth and on those damaged relatively late in growth. Plants not protected from early damage failed to respond sufficiently to irrigation to give an increase in yield equivalent to that of the combined insecticide and irrigation treatments. [From author's summary.]—Nat. Veg. Res. Stat., Wellesbourne, Warwick.

Celery and celeriac.

(*See also* 7549.)

7719. VLUG, J.
Rond het planten van Bleekselderij. **(Planting self-blanching celery.)** *Groent. en Fruit*, 1965, **20**: 2073, illus.

Plant spacings on light and heavy soils were investigated [for a similar trial in the previous year see *H.A.*, 35: 952]. Spacings recommended are 40 × 30 cm. on light soils and 35 × 30 cm. on heavy soils. A wider spacing of 40 × 40 appeared to have no advantages, and the narrowest (30 × 30 cm.) reduced stick size although the yield per acre was high.

7720. THAYER, P. L., AND WEHLBURG, C.
***Pseudomonas cichorii*, the cause of bacterial blight of celery in the Everglades.** *Phytopathology*, 1965, **55**: 554-7, bibl. 14, illus.

Twenty-three bacterial isolates from diseased celery in the Everglades were compared with 5 isolates of *Pseudomonas cichorii* and 2 of *P. apii*. The celery isolates were identical with *P. cichorii* in pathogenicity to celery, cabbage, escarole and chrysanthemum. The isolates of *P. apii* were old and not pathogenic. [From authors' abstract.]—Everglades Exp. Stat., Belle Glade, Fla.

7721. WESTERN AUSTRALIA DEPARTMENT OF AGRICULTURE.
Leaf spot of celery. *J. Dep. Agric. W. Aust.*, 1965, **6**: 128, illus.

The control measures recommended are hot water treatment of the seed at 118° F. for 30 min., regular sprays of Dyrene at 2 lb./100 gal. and crop rotation.

7722. EBNER, L.
Über die Nebenwirkung verschiedener Harnstoff-Herbizide auf einige Pilzarten. **(The secondary action of different urea herbicides on several fungus species.)** [English summary ½ p.] *Z. PflKrankh.*, 1965, **72**: 344-50, bibl. 9.

Of 6 herbicides tested on celery, C3126 and linuron showed the best fungicidal activity against *Septoria apii* and showed little phytotoxicity.—Ciba Aktiengesellschaft, Basel.

7723. MINISTRY OF AGRICULTURE, LONDON.
Celery fly. *Adv. Leafl. Minist. Agric., Lond.*, **87**, revised 1965, pp. 4, illus.

Damage by *Philophylla heraclei*, its life history and control by isolation of the crop, burning and insecticide sprays.

7724. MORAVEC, J., AND KVASNIČKA, S.
Posouzení československých a zahraničních odrůd hlíznatého celeru *Apium graveolens* L. var. *rapaceum* (Mill.) DC. **(Evaluation of Czechoslovak and foreign celeriac varieties.)** [English, Russian and German summaries ½ p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 147-62, bibl. 34, illus.

Celeriac varieties were classified, according to root shape, into 9 types. The oldest types, characterized by broad conical roots, produced the highest yields, whereas the new varieties, with oval to round roots, showed better quality but gave lower yields. Environment had a greater effect on the variability of the properties studied (yield, quality and storability) than did the variety, although varietal influence was also significant. Varietal differences in flesh quality were greater during wet years, and in yield during dry years.

Cucurbits—varieties, culture and physiology.

(*See also* 7017, 7647, 8020, 8032, 8057.)

7725. HUGHES, G. R., AND OTHERS.
Cucumber production in North Carolina. *Ext. Circ. N.C. agric. Ext. Serv.* **383**, revised 1964, pp. 20, illus.

Advice on general aspects of cultivation, harvesting and marketing, with notes on slicing and pickling varieties. Recommendations for the control of common pests and diseases are included.

7726. HEINO, M.
Avomaankurkun viljelystä saaristossa. **(Cucumber growing in the open on the Archipelago.)** *Puutarha*, 1965, No. 4, pp. 222-3; No. 5, pp. 280, 291, illus.; No. 6, pp. 363-4, illus.

On the frost-free south-western archipelago of Finland.

7727. OROS, V., AND CIORTEA, H.
Considerații tehnico-economice asupra culturii castraveților Cornichon. **(Technical and economic considerations on growing cucumbers of the variety Cornichon.)** *Grăd. Via Liv.*, 1965, **14**(4): 4-13.

Areas of co-operative farms in Romania, harvesting dates, hectare-yields, size grades and costs.

7728. HALLIG, V. A., SALOKANGAS, K., AND ÅVALL, H.
Symposiet gurkor. **(A cucumber symposium.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 320-6.

The three speakers at the symposium were as follows: V. A. Hallig, who discussed improvements in cultural methods that had led to an increase in cucumber growing in Denmark, despite the existence of problems requiring further research (growing in peat, spacing and varieties); K. Salokangas, who discussed the value of F_1 hybrid cucumbers in Finland; and H. Åvall, who, in "A study on the development and quality of cucumber fruits", described Swedish research that showed that the largest number of fruits of the greatest weight were produced by the top 201 to 205 cm. of the cucumber plants.

7729. KOOMEN, J. P.
Grotere oogstzekerheid van augurken in de vollegrond. **(Surer yields from gherkins in the open.)** *Groent. en Fruit*, 1965, **20**: 1861, illus.

Advice from Alkmaar Research Station on windbreaks, varieties, sowing or planting (sowing under glass and transplanting outyields direct sowing) and use of plastic mulch. [For an earlier Alkmaar publication on gherkins see *H.A.*, 33: 5050.]

7730. DITTRICH, K.
Freilandgurken für die Konservierung. **(Field cucumbers for preserving.)** *Rhein. Mschr. Gemuse-, Obst- u. Gartenb.*, 1964, **52**: 260-1, from abstr. in *Informationsdienst Weihenstephan*, 1965, No. 5, p. 68.

In trials of the cucumber varieties Mainstolz, Guntruud and Delikatess line 5, Mainstolz was the highest yielding and most suitable for processing.

7731. ŠAHOV, A. A., KAPLINA, G. T., AND JUSUPOV, M.
Pre-sowing irradiation of seeds with impulses of concentrated light. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 274-80, bibl. 17.

Pre-sowing treatment of tomato and cucumber seeds with impulses of concentrated sunlight (50–100 cal./sq. cm.) for 20, 30 and 45 min. increased plant growth, development and yields compared with untreated controls. The effects were greater on yields of early-ripening varieties compared with late-ripening varieties and were greatest with the 45-min. treatment. Measurements made at 2-hour intervals showed that seed irradiation increased the intensity of photosynthesis in cucumbers compared with that of untreated plants or of plants raised from seeds which had been kept in darkness at 40–45° C. for 45 min.

7732. DIJKHUIZEN, T.
De technische kant van komkommers belichten. **(The technique of lighting cucumbers from one side only.)** *Groent. en Fruit*, 1965, **20**: 2357, 2359, illus.

Three types of lamp are described and compared for lighting capacity and cost: viz. mixed-light (a combination of incandescent and high-intensity mercury vapour lamps), high-intensity mercury vapour, and fluorescent types. The cheapest mixed-light lamp was of particular value to the small grower with only a few plants, because it could be moved about and set up easily unlike the other types. Fluorescent lamps gave more uniform illumination of the crop than did mercury vapour lamps but were the most expensive.—Proefstat. Groent. Fruit. Glas, Naaldwijk.

7733. Mănescu, B.
Consideraţii cu privire la regimul termic în răsadniţele cu încălzire tehnică. **(Considerations on the heat regime of artificially heated hot-beds.)** [English, Russian and French summaries 13 lines each.] *Grăd. Via Liv.*, 1965, **14**(2): 23-30.

In studies on different methods of heating hot-beds, maximum seedling and cucumber growth was obtained using both soil and air pipes. Only air pipes were necessary when the seedlings were planted out in March or April.

7734. Panait, T., and Saviţchi, P.
Influenţa culiselor de protecţie asupra producţiei la castraveţi. **(The effect of shelter belts on cucumber yields.)** [French and Russian summaries ½ p. each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 271-6, bibl. 9.

Of 4 shelter crops tested, belts of maize and Sudan grass spaced 7 m. apart promoted the highest cucumber yields. These were 78·2 and 25·4% greater than those of the controls, respectively.

7735. Lepiksaar, I.
Einfluss der Wasserversorgung auf den Nährstoffhaushalt bei der Anzucht von Gewächshausgurkenjungpflanzen in Torfkultursubstrat. **(The influence of water supply on nutrient economy in the cultivation of young greenhouse cucumber plants on a peat substrate.)** [Russian and English summaries ¼ p. each.] *Arch. Gartenb.*, 1965, **13**: 24-34, bibl. 11.

The total water consumption of plants from the seedling to the transplant stage averaged 500 ml./plant. Nutrients (17 mg. N and 13 mg. K_2O/plant) were added with the water supply. There was considerable leaching of nutrients, especially N, with excessive water supply.—Inst. Gemüseb. Grossbeeren.

7736. Baumann, E.
Zur Nachdüngung mit Torf hergestellter Substrate während der frühen Gurkenanbaues in Gewächshäusern. **(Top-dressing of prepared peat substrates during the cultivation of early cucumbers in greenhouses.)** [Russian and English summaries ¼ p. each.] *Arch. Gartenb.*, 1964, **12**: 613-27, bibl. 8, illus.

A mixture of soil, peat and 20% FYM was used as a substrate for early cucumbers. Top-dressings of both soil and mineral fertilizers during growth did not enhance yields.—Humboldt-Univ. Berlin, Grossbeeren.

7737. Lepiksaar, I.
Die Düngung von Gewächshausgurkenjungpflanzen bei Anzucht in Torfkultursubstrat. **(The manuring of young greenhouse cucumber plants grown on a peat substrate.)** [Russian and English summaries ¼ p. each.] *Arch. Gartenb.*, 1965, **13**: 35-52, bibl. 24.

The most favourable fertilizer dose for young cucumber plants on a white peat substrate was 175 g. N, 200 g. P_2O_5, and 350 g. K_2O per cu. m. Ammonium nitrate was the most suitable form of N. A nutrient deficiency occurring while the young plants were being raised caused lower yields and delayed harvest.—Inst. Gemüseb. Grossbeeren.

7738. Calcatin, N.
Influenţa îngrăşării diferenţiate asupra producţiei la castraveţi. **(The effect of different fertilizers on cucumber yields.)** [French and Russian summaries ½ p. each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 277-81, bibl. 9.

In these experiments manure produced the highest yields, giving a 33% increase over the controls. Increases obtained with a mixture of manure and bacterial fertilizer, mineral fertilizer and a mixture of manure and minerals were 31, 24 and 24%, respectively.

7739. Bergmann, W., Büchel, L., and Wrazidlo, W.
Bor- und Stickstoff-Überschusssymptome bei Gewächshausgurken sowie Borschäden bei einigen anderen Pflanzen. **(Excess boron and nitrogen symptoms in greenhouse cucumbers as well as boron damage in several other plants.)** [Russian and English summaries ¼ p. each.] *Arch. Gartenb.*, 1965, **13**: 65-76, bibl. 15, illus.

Chloroses and necroses characteristic of excess B and N in cucumbers and excess B in cyclamen and tomatoes are discussed and illustrated.—Inst. PflErnähr. Jena.

7740. Slobbe, A.
Supplementary carbon dioxide for autumn cucumbers. [Dutch.] *Tuinderij*, 1964, **4**: 954-5, from abstr. in *Informationsdienst Weihenstephan*, 1965, No. 5, p. 87.

The use of supplementary CO_2 advanced harvest date and increased yields.

7741. Atsmon, D., Galun, E., and Jakob, K. M.
Relative time of anthesis in pistillate and staminate cucumber flowers. *Ann. Bot., Lond.*, 1965, **29**: 277-82, bibl. 9.

Staminate (male) floral buds of cucumber plants reach anthesis at consecutive nodes of the main shoot at regular time intervals; however, pistillate (female) buds reach anthesis earlier than male ones, thus causing a marked deviation from the linear chronological sequence of male anthesis along the main shoot. Measured in days, this relative precedence of the female is greatest in winter planting time, when short days and low temperatures cause a shift towards femaleness in the whole plant, and it is smallest in late summer planting when environmental conditions favour male tendency. There are also varietal differences in this respect—in one variety (Beta Alpha) the female precedes the male by a longer period of time than in another variety (Yorkstate Pickling). The position of the female flower on the main shoot does not seem to play an important role in this respect, but, as a rule, the precedence is greater for the first female than for the second or third female developing on the main shoot. It is suggested that the relative enhancement of one type of sex organs (carpels) is a continuous process which determines the final sex type of the flower and later causes it to reach anthesis earlier. [Authors' abstract.]—Weizmann Inst. Sci., Rehovot.

7742. Galun, E., Izhar, S., and Atsmon, D.
Determination of relative auxin content in hermaphrodite and andromonoecious *Cucumis sativus* L. *Plant Physiol.*, 1965, **40**: 321-6, bibl. 24.

The methods used are described. The auxin content of hermaphrodite plants was greater than that of andromonoecious plants when sections either of equal leaf size, or containing equally developed floral buds, of the 2 sex types were compared. [From authors' summary.]—Weizmann Inst. Sci., Rehovot.

7743. MOCKAITIS, J. M., AND KIVILAAN, A.
A green corolla mutant in *Cucumis melo* L. *Naturwissenschaften*, 1965, **52**: 434, bibl. 5, illus.

Of the 725 progeny of a selfed F_5 plant 185 produced only green flowers. These were female-like but nonfunctional, with a corolla of normal shape but leaf-like in pigmentation and venation.

7744. ZUBOV, A. A.
Changes in the chemical composition, flavour and flesh firmness of melons under the influence of a squash rootstock. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 225-30, bibl. 8.

In 3 years' trials scions of 5 melon hybrids and 1 melon variety were grafted onto 4 squash rootstock varieties. The influence of the rootstock on fruit characteristics depended on the graft components and the environmental conditions. A positive correlation was found between the quantity of dry matter synthesized by the rootstock and the amount accumulated by the scion. Changes in the characteristics of the hybrids obtained under the influence of squash rootstocks were considerably greater than those of the melon variety. The melon fruit contents of dry matter, sugars and vitamin C and the texture of the flesh were all influenced by the squash rootstock, but the carotene and starch contents were not affected. Coarse textured, poor flavoured squash rootstocks reduced the consistency and flavour of the melon fruits. The changes produced using a squash rootstock were inherited by succeeding generations.

7745. ATAULLAEV, N. A.
The effect of ultrasonics on the yields of melon and maize. [Russian, with English, German and French summaries 5 lines each.] *Vestn. sel'sk. Nauki*, 1965, **10**(2): 27-31, bibl. 6.

Melon seeds previously soaked in water for 24 hours were exposed to ultrasonic waves of 23·5, 1,000 or 1,250 kilocycles for 1, 3, 6, 9 or 12 min. Treatment for 1 or 3 min. stimulated growth and development, increased yields and (especially at the lowest level) accelerated fruit maturity. More prolonged treatment was not necessarily advantageous. The resistance of the plants to *Fusarium* spp. was not affected by treatment.

7746. BOBKOVA, L. P.
Causes of wilting of musk-melons during excessive irrigation. [Russian, with English summary 13 lines.] *Fiziol. Rast.*, 1965, **12**: 64-8, bibl. 7.

Musk-melons were irrigated with 3,000 to 5,000 cu. m. of water per ha. applied over 2 days, or with 900 to 1,700 cu. m. per ha. applied over 12 hours. The percentage of plants that died from wilting was greater with the higher amount of irrigation. Excessive irrigation caused a lowering of the leaf water content and an increase in the percentage of ammonium N in the xylem sap, and also caused anomalies in the rate of water loss from the leaves and the rate of sap exudation: these rates were increased in a dry year and reduced in a more temperate year.

7747. LINGLE, J. C., AND WIGHT, J. R.
Fertilizer experiments with cantaloupes. *Bull. Calif. agric. Exp. Stat.* **807**, 1964, pp. 22, bibl. 11.

PMR 45 cantaloupes were grown at 2 stations with different rates and combinations of N, P and K fertilization. Yield increases of 25 to 300% were observed after the application of N, depending on the soil and the season. Smaller increases in yield were observed after the use of P. P fertilization hastened fruit maturity, especially when heavy N applications were made. Banding the P fertilizer increased its efficiency several times. K had no detectable effect on yield at either location. In very N-deficient soils, the application of this element increased the soluble solids content and the size of the fruit, as well as the percentage of the fruits that were marketable. P or K fertilization did not have much effect on these quality characteristics. Tissue analysis changes resulting from fertilizer variables were related to yield and quality responses, with a view of using tissue analysis as a diagnostic tool in the fertilization of this crop. [Authors' summary.]—Univ. Calif., Davis.

7748. IVANOFF, S. S.
Micronutrient deficiencies of cantaloupes as related to the proximity and profile of the subsoil level. *Bull. Miss. agric. Exp. Stat.* **687**, 1964, pp. 8, bibl. 7.

A micronutritional disease common in Mississippi is described, wherein cantaloupe vines turn yellow from the start and some die. Foliar sprays of 0·1% zinc sulphate, sodium molybdate and boric acid each induced quick recovery of chlorotic vines followed by rapid growth. Foliar application of compounds of Cu, Fe, Mg and Mn and of NPK caused no significant improvement, and Ca nitrate had an intermediate effect. The clay subsoil presented an undulating profile, being 12–14 in. below the sandy surface under healthy plants and 21–24 in. below the surface under chlorotic plants. [See also *H.A.*, 34: 4709.]

7749. VYAS, D. N., AND OTHERS.
Ascorbic acid and ascorbic acid oxidase of γ-irradiated *Momordica charantia*. *Naturwissenschaften*, 1965, **52**: 345-6, bibl. 3.

In the seeds.

7750. BANERJI, D., AND LALORAYA, M. M.
Expansion of isolated punpkin cotyledons with kinetin: effect of seedling age. *Naturwissenschaften*, 1965, **52**: 349-50, bibl. 3, illus.

Cotyledons excised from seedlings of nil to 170 mm. hypocotyl length were incubated for 3 days in 20 p.p.m. kinetin solution or in water, in the light or in the dark. In the light the increase in area was greater with kinetin treatment than with water treatment in cotyledons from seedlings of nil to 120 mm. hypocotyl length. Only 5 mm.-hypocotyl length seedlings were tested in the dark, and here again kinetin treatment caused greater expansion of cotyledons than water treatment. Expansion was, however, about half that observed in the light.—Univ. Allahabad.

7751. POSPÍŠILOVÁ, J., AND TOUL, V.
Obsah karotenoidů v tykvi (*Cucurbita* L.). **(The carotenoid content of squash, *Cucurbita* spp.).** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 132-49, bibl. 14, illus.

Carotenoids were determined in a large number of varieties of 4 squash species. In *Cucurbita moschata* and *C. maxima* there were more carotenoid-rich varieties, whereas in *C. pepo* varieties with lower carotenoid contents occurred more frequently. The highest values were found in the varieties Nagydobosi Sütőtök (16·42 mg.%) and Golden Delicious (17·78 mg.%). In 3 forms of *C. ficifolia* the carotenoid content ranged from traces to 3·26 mg.%.

7752. JAMAICA AGRICULTURAL SOCIETY.
Growing watermelon. *Fmr, Jamaica*, 1965, **70**: 14-15.

Soils, varieties and culture including mulching and fertilization.

7753. CRALL, J. M.
Jubilee: a black-seeded Garrison-type watermelon. *Circ. Fla agric. Exp. Stats* **S-148**, 1963, pp. 8, illus.

Possessing partial resistance to *Fusarium* wilt and resistance to anthracnose Race I [*Colletotrichum lagenarium*].

7754. LOCASCIO, S. J.
Melons: is copper deficiency reducing your yields? *Amer. Veg. Gr*, 1965, **13**(6): 26, illus.

Watermelons growing in a fine sandy soil developed severe Cu deficiency symptoms when a high-N analysis fertilizer containing almost no Cu was applied. The symptoms are described. When N from organic sources or as little as 6 oz./acre of Cu was added to the fertilizer the deficiency was corrected. The addition of small amounts of $CuSO_4$ to low analysis fertilizers increased yields substantially even when no deficiency symptoms were apparent. [For earlier work see *H.A.*, 33: 7209.]—Univ. Fla, Gainesville.

7755. OKE, O. L.
Nutritive value of Nigerian water melon. *Nature*, 1965, **207**: 192, bibl. 3.

An analysis of the seed.

Cucurbits—diseases and pests.

(*See also* 6938.)

7756. VAN DORST, H. J. M.
Herfstkomkommers en komkommervirus 1. **(Autumn cucumbers and cucumber virus 1.)** *Groent. en Fruit*, 1965, **20**: 2271, illus.

Disease symptoms developed more rapidly when inoculation took place in late September compared with a mid-September inoculation, and at 15·5° C. rather than at 21°. Symptoms in the fruits were more severe at 21°, but only 6% were affected compared with 75% of the crop grown at 15·5°. Nylon gauze fitted over the ventilators was an efficient barrier to aphid vectors; when such barriers were used only 1·5% of the plants were infected with virus transmitted by aphids, compared with 24% where the crop was not protected.—Proefstat. Groent. Fruit. Glas, Naaldwijk.

7757. SINGH, R. P., AND LAL, S. B.
The effect of certain chemotherapeutic agents on cucumis virus 2C in bottlegourd (*Lagenaria siceria*). *Plant Dis. Reptr*, 1965, **49**: 493-4, bibl. 7.

Ten compounds were tested at various concentrations; acriflavine inhibited the development of mosaic disease by 50% but was phytotoxic at the rates used (0·5% and 1·5%). Crystal violet (6 p.p.m.) and 2-thiouracil (0·002 M) also partly inhibited the virus; the latter was phytotoxic.—Government agric. Coll., Kanpur, U.P., India.

7758. LOEBENSTEIN, G., ALPER, M., AND DEUTSCH, M.
Preventing aphid-spread cucumber mosaic virus with oils. *Phytopathology*, 1964, **54**: 960-2, bibl. 3.

A 1% oil emulsion in water, with the addition of detergent, was highly effective in preventing CMV-carrying *Aphis gossypii* from infecting sprayed cucumber plants in the greenhouse. Many viruliferous aphids lost their virus while probing on freshly sprayed plants and only a few were able to acquire CMV from infected sprayed plants. The spread of CMV by aphids from sprayed-infected to sprayed-healthy plants was prevented almost completely. The effect lasted for 5–7 days. Phytotoxicity was slight or not detected. [From authors' abstract.]—Nat. Univ. Inst. Agric., Rehovot, Israel.

7759. SEHGAL, O. P.
Effect of chloramphenicol on the concentrations of free amino acids and amides in healthy and cucumber mosaic virus (CMV-Y) infected plants. Abstr. in *Phytopathology*, 1964, **54**: 907.

Cucumber plants were raised in sand and supplied with Hoagland's solution containing micronutrients. Virus infection reduced the amounts of glutamic and γ-aminobutyric acids in inoculated leaves after 5 days of infection, but glutamine increased in inoculated and in non-inoculated leaves. After 9 days of infection, lower levels of alanine and γ-aminobutyric acid occurred in inoculated leaves; decreases in the amounts of glycine, serine and alanine occurred in systemically infected leaves. Glutamine accumulated in inoculated and in systemically invaded leaves. When chloramphenicol solution (50 mg./l.) was supplied to plants through the roots for 5 days following inoculation, a striking accumulation of all amino acids occurred in healthy and diseased plants. This effect was more pronounced in 5- than in 9-day infected plants. Although there were variations in the levels of individual amino acids in plants treated with chloramphenicol, the infected plants contained a lower amount of total amino acids. This indicated gross differences in the amino acid metabolism between healthy and diseased plants. Chloramphenicol also inhibited the multiplication of cucumber mosaic virus in infected plants.—Univ. Mo., Columbia.

7760. WEBB, R. E., BOHN, G. W., AND SCOTT, H. A.
Watermelon mosaic viruses 1 and 2 in southern and western cucurbit production areas. *Plant Dis. Reptr*, 1965, **49**: 532-5, bibl. 12.

Data are presented on the occurrence of the viruses in melons, watermelons, cucumbers and squash in 13 areas.

7761. GOODE, M. J.
Accumulations of sulfur^{35} around cucumber anthracnose lesions. From abstr. in *Phytopathology*, 1964, **54**: 893.

Resistant and susceptible cucumber plants absorbed S^{35} through their roots, and were inoculated with *Colletotrichum lagenarium* (*C. orbiculare*) race 1, or wounded, and autoradiograms of leaves were made at intervals thereafter. Accumulation patterns of radioactivity were associated with disease lesions on both resistant and susceptible plants. In resistant leaves accumulations were heavy, but the areas did not enlarge beyond 2 mm. Narrow rings formed around approximately one-third of the lesions beyond the points of radial penetration by the fungus. Accumulations did not occur beyond the ring. In susceptible leaves rings were associated with each lesion, and heavy concentrations of radioactivity continued to form outside the ring, just beyond the periphery of developing lesions. As the cells died the S^{35} was not translocated, and radioactive emissions from necrotic areas continued. No accumulation patterns were associated with bruising wounds on either type of plant. S^{35} accumulated around puncture wounds on the anthracnose-resistant plants, but diminished with time. No accumulation patterns were evident around similar wounds on anthracnose-susceptible plants. Anthracnose resistance appeared to be an active process.—Univ. Ark., Fayetteville.

7762. Besson, J.

Tests de produits fongicides contre l'anthracnose du melon (*Colletotrichum lagenarium*). **(Tests with fungicides for the control of melon anthracnose.)** *Phytiat.-Phytopharm.*, *Paris*, 1964, **13**: 115-22, bibl. 1.

The following treatments were applied to young Charentais melon plants in pots: Doguadine at 90 g. a.i./hl., carbathene+copper oxychloride at 200 g. a.i./hl., dichlone at 80 g. a.i./hl. and maneb at 250 g. a.i./hl. A spreader was added to all solutions except Doguadine. The plants were then inoculated with *C. lagenarium*. Dichlone gave excellent control of anthracnose, and no phytotoxicity was observed. Maneb was also satisfactory, effectively preventing neck rot. Although Doguadine and carbathene+copper oxychloride controlled infection on the leaves, they did not provide any protection from neck rot, as they ceased to be active on contact with the soil.—Serv. Prot. Vég., Toulouse.

7763. Leben, C., and Daft, G. C.

Control of leaf diseases by a bacterium. Abstr. in *Phytopathology*, 1964, **54**: 898.

Greenhouse tests with isolate A180, an epiphytic or resident bacterium from cucumber leaves, demonstrated that sprays containing washed cells of this organism protected cucumber seedlings from anthracnose disease. When resident-treated plants were placed in a moist chamber 2–3 days prior to inoculation with the pathogen, better disease control was obtained than when treated plants were left in the open air of the greenhouse before inoculation. Disease control was improved by using nutrient broth or a soybean-oil meal broth in spray preparations containing washed cells of A180. Washed cells plus nutrients also reduced early blight of tomato in some greenhouse tests.

7764. Grewal, J. S., and Mathur, S. B.

Control of powdery mildew of "kakri" with Karathane. *Indian J. Hort.*, 1964, **21**: 262-3, bibl. 2.

Wettable sulphur, sulphur dust and Karathane all gave good control of powdery mildew (*Erysiphe cichoracearum*) on kakri (*Cucumis melo* var. *utilissimus*). Best results were obtained with Karathane applied at ¼ lb./100 gal. every 10 days, namely, 2–3% infected leaves after 2 sprays compared with 45–51% in the control.—Indian agric. Res. Inst., New Delhi.

7765. Bravenboer, L.

Cucumber production in Holland with special consideration to some crop protection problems. *PflSch.-Nachr. Bayer*, 1965, **18**: 45-52, bibl. 4.

Powdery mildew (*Erysiphe cichoracearum*) and the two-spotted red spider mite (*Tetranychus urticae*) are among the chief problems of Dutch glasshouse-cucumber growers. In a trial with Eradex quinoxaline-2,3-trithiocarbonate) on mildew-inoculated frame cucumbers for the combined control of mildew and mites 9 treatments at 0·1% were applied at about 10-day intervals between mid-May and mid-August. After the 4th spray control was much greater with Eradex than with the standard treatment. At the end of the trial there were only 120 mildew spots in the Eradex plots compared with 850 in the standard-treatment plots and the number of mites, nymphs, larvae and eggs per 40 leaves were 1,300, 53,000 and 30,000 with Eradex, standard treatment and control, respectively. In a similar experiment on mildew-inoculated glasshouse cucumbers Morestan (6-methyl-quinoxaline-2,3-dithiolcarbonate) at 0·025% was applied 11 times at 10-day intervals beginning in mid-May. Infection was always much less in the Morestan than in the other plots after the 4th application and the numbers of *T. urticae* (all stages) per 36 leaves were 50,000 with Morestan, 74,000 with the standard treatment and 80,000 in the control. [See also *H.A.*, 35: 2472.]—Proefstat. Groent. Fruit. Glas, Naaldwijk.

7766. Strider, D. L., and Konsler, T. R.

An evaluation of the *Cucurbita* for scab resistance. *Plant Dis. Reptr*, 1965, **49**: 388-91, bibl. 11.

Seven resistant and 21 tolerant introductions were found and incorporation of this resistance into summer squash may be feasible. [For fungicidal control of scab see *H.A.*, 33: 7218.]—Univ. N.C., Raleigh.

7767. Mahadevan, A.

Biochemistry of resistance in cucumber against *Cladosporium cucumerinum*. Abstr. in *Phytopathology*, 1964, **54**: 899-900.

Cucumber varieties Fletcher (resistant) and National Pickling (susceptible) were used. Seedlings were grown in rolled paper in the dark at 21° C. and inoculated with a heavy spore suspension when the hypocotyl length was about 6–8 cm. Fletcher hypocotyls showed little increase in total phenols after inoculation, whereas the phenol content in National Pickling increased up to 48 hours and then declined with the appearance of symptoms. Ethanolic and water extracts from healthy and infected hypocotyls of both varieties reduced fungal growth, but extracts from the resistant variety gave maximum reduction. Hypocotyl segments of Fletcher, but not National Pickling, prevented the production of pectinolytic enzymes when incubated in a heavy spore suspension. Dialysed preparations from frozen hypocotyls of resistant seedlings inhibited commercial pectinase activity. Resistance seems to be associated with decreased production and activity of pectinolytic enzymes and decreased growth of the pathogen.—Purdue Univ., Lafayette, Ind.

7768. Crossan, D. F.

Fungicide sprays for cucumber scab control. *Plant Dis. Reptr*, 1965, **49**: 312-13, bibl. 6.

Six foliar sprays were compared for the control of *Cladosporium cucumerinum* in the field. Fungicides containing maneb or maneb+Zn reduced the number of severely infected fruits to an average of 18–23% compared with 60% on unsprayed plots, but were less effective in reducing the numbers of slight infections. A rate of 6 lb. per acre gave little more control than 2 lb.

Plants treated with DAC 2787 (tetrachloroisophthalonitrile) had an average of only 7·8% severely infected fruits and gave the greatest number of marketable fruits, but DAC 2787 was not significantly better for disease control than maneb or Dithane M-45 (Zn ion+maneb). Difolatan proved unsatisfactory. [For related work see *H.A.*, 34: 5082.]—Univ. Del., Newark.

7769. Gurlev, A., and Platonova, E.
Kelthane in glasshouses. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(5): 26.

A 20% solution of Kelthane in xylol, applied at concentrations of 0·05 and 0·1%, gave good spider mite control on cucumbers without causing leaf damage. It was necessary to combine Kelthane with 0·05% parathion or 0·1% anabasine sulphate to control aphids.

7770. Steiner, L. F., and others.
Melon fly eradication by overflooding with sterile flies. *J. econ. Ent.*, 1965, **59**: 519-22, bibl. 4.

Eradication of the melon fly (*Dacus cucurbitae*) on Rota island was obtained by releasing 257 million flies irradiated as pupae with 9·5 kr. from a Co^{60} source.—U.S.D.A., Honolulu, Hawaii.

Legumes—beans (Phaseolus species): varieties, culture and physiology.

(*See also* 6892, 7841.)

7771. Reece, F. N., and Fitzgerald, L. W.
Equipment for edible dry bean production. [*Publ.*] *Farm Mach. Ext. Serv., Kans. St. Univ.*, **12**, 1961, pp. 8, illus., [received 1965].

Machinery for planting, cultivation, insect control and, particularly, harvesting of Pinto beans and black-eyed peas.

7772. Delčev, I.
A study of vegetative hybrids of beans of the third seed generation (V_3). [Bulgarian, with English and Russian summaries ½ p. each.] *Rasten. Nauki*, 1965, **2**(2): 3-10, bibl. 11, illus.

The third seed generation obtained from 418 lines of vegetative hybrids of *Phaseolus vulgaris* was characterized by great morphological variation. Bush, creeping and intermediate habits were found, producing white, coloured and mottled seeds. There was considerable resemblance to the F_2 generation of sexual hybrids. [For previous work see *H.A.*, 35: 3404.]—V. Kolarov Higher agric. Inst., Plovdiv.

7773. Freytag, G. F.
Clasificación del fríjol común (*Phaseolus vulgaris* L. y especies afines). **(Classification of the common bean (*P. vulgaris* and related species).)** [English summary 12 lines.] *Ceiba*, 1965, **11**: 51-64, bibl. 29.

The author presents a revision of the major classifications which recognizes two species, *P. vulgaris* and *P. coccineus*, for the normally used concept of *P. vulgaris*.

7774. Buishand, T.
Rassenkeuze bij spekbonen. **(Selection of brown bean varieties.)** *Groent. en Fruit*, 1965, **20**: 2081, illus.

Six varieties were compared at Alkmaar in preliminary trials. Neckarkönigin gave the heaviest yield and bore long pods. Two smaller varieties with very long pods—Nos. 1214 and 5148—were considered suitable for processing; No. 5148 was adversely affected by a dry hot summer and the pods rapidly became stringy.

7775. Vieira, C.
Melhoramento do feijoeiro (*Phaseolus vulgaris* L.) no Estado de Minas Gerais. I. Ensaios comparativos de variedades realizados no período de 1956 a 1961. **(Selection of *Phaseolus vulgaris* beans in Minas Gerais State. I. Comparative varietal trials in 1956-61.)** [English summary 1½ pp.] *Experientiae*, 1964, **4**(1): 1-68, bibl. 39.

Some 180 bean varieties from Latin America, the U.S.A. and Portugal, and from various parts of Brazil were compared in 12 trials carried out, chiefly at Viçosa, in the dry and the wet season between 1956 and 1961. Varieties of the Manteigão group, which have large multicoloured beans, performed best, and Prêto was the best of the small-beaned groups. The best-yielding varieties were Manteigão-Prêto-20 (1,163 kg./ha.), Baetão-Manteiga-41 (1,114 kg./ha.), Manteigão-Lustroso-13 (1,074 kg./ha.), Rico-23 (1,042 kg./ha.) and Manteigão-Fôsco-11 (985 kg./ha.). Manteigão-Prêto-20 was resistant to anthracnose, rust and angular leaf spot and is therefore recommended despite the limited commercial value of its type. Manteigão-Fôsco-11 was resistant to rust, powdery mildew (apparently), root-knot nematode and, for some years, anthracnose and is recommended because of its commercial desirability until better varieties of the type are available. The small black bean Rico-23 is recommended because it was resistant to anthracnose, rust and apparently to powdery mildew and is of high commercial value in some areas. The most destructive bean diseases in Viçosa were anthracnose (*Colletotrichum lindemuthianum*) and rust (*Uromyces phaseoli* var. *typica*). A Tepary bean variety from California, *P. acutifolius* var. *latifolius*, gave poor yields and its small white beans were commercially unattractive. [See also *H.A.*, 34: 6764.]

7776. Moreno Sanchez, C.
Descripción de las principales variedades de frejoles que se cultivan en el pais. **(Description of the chief varieties of *Phaseolus* bean grown in Chile.)** *Agric. Ganad., Chile*, 1965, **9**(30): 12-23, illus.

A description is given of 8 varieties for local consumption and 5 export varieties. Tórtolas is the chief of the former and Arroz of the latter. Only the export varieties, Robust, Michelite and Arroz, are resistant to mosaic.

7777. Buishand, T.
Stoksnijbonen met en zonder draad. **(Climbing french beans with and without wire.)** *Groent. en Fruit*, 1965, **20**: 1727, illus.

Beans grown with and without supports were tested at Alkmaar in 1964; a selection of the best varieties is described for each method.

7778. Cackett, K. E.
Winter production of seed beans in the lowveld. *Rhod. agric. J.*, 1965, **62**: 69-71, 73, bibl. 4.

Four years' studies are reported, including trials for yield potential and disease tolerance on 30 varieties, the effects of different N levels on seed yields, spacing and seed rates, and irrigation requirements.—Sabi Valley Exp. Stat.

7779. McMaster, G. M., and others.
The influence of soil moisture on snap bean seed production. *Bull. Idaho agric. Exp. Stat.* **435**, 1965, pp. 20, bibl. 15, illus.

The varieties Topcrop and Wade were given 4 irrigation treatments. Two different moisture levels were maintained in 2 growth phases, viz. from planting to blossoming and from blossoming to maturity. The moisture levels were obtained by irrigating when the soil moisture deficit reached either 40% or 60%. The higher moisture level early in the season caused early maturing and increased yield of seed. The lower moisture level later in the season also tended to hasten maturity but at the expense of yield. The lower irrigation level early followed by the higher level later gave larger seeds but delayed maturity. Few varietal differences were observed. Germination tended to be higher for those seeds which had been grown under the higher moisture level for the whole season, especially when artificially injured.

7780. Dreibrodt, L.
Zeitigere Gemüseerträge durch Vorverlegung des Anbaus bei Buschbohnen und Buschtomaten. **(Early vegetable yields by advancing the planting of bush beans and bush tomatoes.)** *Dtsche Gartenb.*, 1965, **12**: 121-2, bibl. 1.

Six years' trials were carried out with bush beans (Consista and Saxa) and 5 years' trials with bush tomatoes (Perfekta and Rotkäppchen), both with 3 sowing dates, viz. mid-May (the usual time) and 10 and 20 days earlier. Better yields and returns were obtained with beans only when sown at the second date. Tomatoes responded well to earlier sowing, especially to the first date.

7781. Burke, D. W.
Plant spacing and *Fusarium* root rot of beans. *Phytopathology*, 1965, **55**: 757-9, bibl. 1, illus.

Bean plants [Red Mexican and other varieties], spaced 3 to 8 inches apart in the row, usually showed less root rot than plants spaced more closely in soil infested by *Fusarium solani* f. *phaseoli*. Wide spacing increased the seed yields of individual plants more in *Fusarium*-infested than in non-infested soil. However, total seed yields were seldom increased by wide spacing. Benefits to individual plants from wide spacing were largely nullified when soil temperatures were adverse to rapid growth. Bean varieties and hybrid selections varied in their ability to compensate for thinning or low rates of planting. Long-vined types showed a greater ability to compensate for wide spacing that did short-vined types. [Author's abstract.]—U.S.D.A., Prosser, Wash.

7782. Kurkina, V. M.
The inter-relationship of nodule bacteria and related bacteria with leguminous plants in pot experiments. [Russian.] *Agrobiologija*, 1965, No. 1, pp. 40-8, illus.

The addition of nodule bacteria to sterile fodder bean and pea seeds at planting time lowered the N content and growth of the plant in soil containing local races of the bacteria. However, similar additions to *Phaseolus* beans seeds increased the air dry weight and the N content of the plants. Both plant growth and N content were improved by combined applications of nodule bacteria and associated types.

7783. Petrova, M.
The manuring of beans grown on slightly leached chernozem. [Bulgarian, with English and Russian summaries ⅓ p. each.] *Rasten. Nauki*, 1965, **2**: 113-17, bibl. 9.

In the period 1953-57, 2 levels of P (30 and 50 kg./ha. P_2O_5) were tested alone and with 20 kg./ha. N, 50 kg./ha. K_2O and 10 tons/ha. FYM. The most effective combination was P+N. The application of 200–250 kg./ha. superphosphate at deep ploughing followed by a pre-sowing application of 50–60 kg./ha. ammonium nitrate is recommended. The FYM treatment was also effective, increasing yields by 200 kg./ha.—Wheat and Sunflower Inst., Tolbukhin.

7784. Jyung, W. H.
Mechanisms of ion uptake by the leaves of *Phaseolus vulgaris* L. *Diss. Abstr.*, 1965, **25**: 3810-11, being *Order No.* 64-4977 of 102 pp.

A more detailed account of work abstracted in *H.A.*, 34: 46. See also *H.A.*, 35: 2363.

7785. Emmert, F. H.
Forces involved in retention and movement of non-metabolic strontium in *Phaseolus vulgaris*. *Plant and Soil*, 1965, **22**: 136-41, bibl. 15.

The bean stem contained an efficient trapping mechanism for strontium, and removed the bulk of ions from the ascending stream soon after it entered the stem. The process of Sr build-up in the hypocotyl base was reversible to some extent. [From author's summary.] —Univ. Conn., Storrs.

7786. Kolev, V.
The effect of zinc sulphate sprays on the phosphorus metabolism of waterlogged bean plants. [Bulgarian, with English and Russian summaries ⅓ p. each.] *Rasten. Nauki*, 1965, **2**(2): 57-62, bibl. 10.

Young bean plants, growing in soil which had been waterlogged for 72 hours, were sprayed with 0·001 M hydrated $ZnSO_4$, and P translocation was studied using P^{32}. The P contents of the leaves and roots, and especially of the roots, was increased by the treatment in waterlogged plants but not in the controls. It is considered that the Zn application tended to restore the connection between respiration and oxidative phosphorylation which was disturbed by the anaerobic conditions caused by waterlogging.

7787. Mellor, R. S., and Salisbury, F. B.
Influence of light regime on the toxicity and physiological activity of herbicides. *Plant Physiol.*, 1965, **40**: 506-12, bibl. 27.

Bean (*Phaseolus*) seedlings were treated with different concentrations of 2,4-D and 2,4-dinitrophenol (DNP) under various light and temperature regimes. The phytotoxicity of DNP increased with increasing periods of darkness which plants received after treatment, the maximum injury occurring at about 12–16 hours. Plants exposed to light after DNP treatment were relatively uninjured. Toxicity was also affected by preceding light treatment and the pH at which DNP was applied in solution. White or red light was more effective than green or blue in preventing damage from DNP. Plants subjected to short periods of ultra-violet radiation did not show the usual epinastic responses to 2,4-D if afterwards placed in the dark: UV radiation prevented epinasty when applied before or after the 2,4-D treatment.—Colo. agric. Exp. Stat., Fort Collins.

7788. Green, D. H.

The effects of varying the depth of planting and period of time between sowing and spraying on the performance of three herbicides in dwarf french beans. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 29.

Logarithmic trials were laid down on beans growing in volcanic loam soil in unusually moist, cool weather in April, 1964, to compare pre-emergence applications of ametryne (0·12–2 lb./acre), desmetryne (0·18–3 lb./acre) and MCPB (0·3–5 lb./acre) under conditions conducive to leaching injury, and to determine the effect of depth of sowing (0·25–2 in.) and date of spraying (1–5 days afterwards) on selectivity. The maximum rate of either triazine tolerated by the beans throughout the season was 0·6 lb./acre, but this depended on sowing being made not less than 2 in. deep and on spraying following within 2 days. Only in the case of desmetryne, however, was early treatment also the most selective. Early post-sowing treatment of land prepared several days in advance would thus seem the best way of combining good crop tolerance with good weed control. There was no significant effect of depth of sowing or time of treatment on the tolerance of beans to MCPB, which delayed emergence, and at the higher rate induced formative effects and gave unsatisfactory residual weed control. [For earlier work see *H.A.*, 33: 5104 and 35: 1010.]—Trop. Pestic. Res. Inst., Arusha, Tanzania.—From *Weed Abstr.*, **14**, No. 75.

7789. de Rezende-Pinto, M. C.

On the metamorphosis of cotyledon plastids of *Phaseolus multiflorus* Willd. *Portugal. Acta biol.*, 1964, **8**: 177-85, bibl. 12, illus.

An illustrated account is given of structural changes occurring in the cotyledon plastids of the scarlet runner bean during seed development and germination under experimental conditions, as observed with the electron microscope.—Lisbon Fac. Med.

7790. Fraíno de Pannier, R.

Isolation and identification of germination inhibitors in seeds of Red Kidney bean (*Phaseolus vulgaris*). [Spanish?] *Acta cienc. venez.*, 1964, **15**: 16-21, bibl. 23, from abstr. in *J. Sci. Food Agric.*, 1965, **16**: i-289.

Aqueous and ether extracts of bean seeds inhibited the germination of oat seeds. The presence of coumarin and of caffeic, protocatechuic, *p*-coumaric, salicylic, ferulic and *p*-hydroxybenzoic acids was demonstrated.

7791. Holden, M.

Chlorophyll bleaching by legume seeds. *J. Sci. Food Agric.*, 1965, **16**: 312-25, bibl. 31.

Seeds and seed extracts of several legumes, including french bean, runner bean, pea, broad bean and lupin, bleached chlorophyll in the presence of long-chain fatty acids. The most effective acids were substrates for lipoxidase, but oleic acid and even palmitic and stearic acids were also active. The bleaching was inhibited by commerical antioxidants. Chlorophyll was bleached by extracts which had lipoxidase activity but not by purified lipoxidase preparations. The addition of lipoxidase to seed extracts stimulated bleaching 2- to 3-fold with linoleic acid but only slightly with oleic acid. The optimum pH for bleaching was about 6, and for linoleate hydroperoxide formation was near 8. Evidence is given that at pH 6 hydroperoxide was being destroyed. Chlorophyll appears to be bleached by co-oxidation during a chain reaction involving peroxidation of fatty acid and the breakdown of hydroperoxide by a heat-labile factor. [From author's abstract.]—Rothamsted exp. Stat., Harpenden, Herts.

7792. Pál, I., Szabó-Hámori, J., and Hajas-Endresz, M.

Gamma-besugárzás hatása a kukorica és a bab csírázására, a csíranövények nitrogén-, foszfor-, valamint szénhidráttartalmának alakulására. **(The effect of gamma irradiation on the germination of maize and bean seeds and on the nitrogen, phosphorus and carbohydrate contents of the seedlings.)** [Russian and German summaries 1 p. each.] *Agrártud. Egyet. mezőgtud. Kar. Közlem., Gödöllò, 1964*, 1964, pp. 321-35, bibl. 22, illus.

The seeds were irradiated at 1,000, 5,000 or 10,000 r. and grown in petri dishes in darkness for 6 days. In beans the 2 higher levels reduced the water uptake and inhibited shoot and root growth. Changes induced by the treatments in the contents of total and soluble carbohydrates, N and P in the endosperm, shoots and roots are shown diagrammatically and discussed.

7793. Moh, C. C., and Alan, J. J.

Observation on the growth response of beans (*Phaseolus vulgaris* L.) to chronic gamma radiation. [Spanish summary 13 lines.] *Turrialba*, 1965, **15**: 64-6, bibl. 4 .

Bean plants irradiated throughout their life were severely injured by more than 600 r. per day at the seedling stage, 337 r. during development of the compound leaves, 140 r. during the production of fruit buds, 94 r. during pod development and 72 r. at seed production. Plants exposed to 72 r. did not produce seeds and could not complete their life cycle. [See also *H.A.*, 35: 1001.]

7794. Yarwood, C. E.

Adaptation and sensitization of bean leaves to heat. *Phytopathology*, 1964, **54**: 936-40, bibl. 16.

Pinto bean leaves heated for 20 sec. at 50° C. were more injured (sensitization) or less injured (adaptation) by subsequent heat than were control leaves, depending on various conditions. If the challenge heat followed the predisposition heat within 1 hour, the greater injury to the predisposed leaves than to control leaves is interpreted as an additive effect of heat. Adaptation was favoured by a predisposition lag of about 24 hours and a challenge heat of about 120 sec. at 50°. Sensitization was favoured by using plants about 18 days from seeding, by predisposition heat in the early morning, by a dark period of about 48 hours during the latter part of the predisposition lag, by high soil moisture, and by a challenge heat of about 4 sec. at 58° in the late afternoon. [From authors' abstract. See also *H.A.*, 33: 2030.]—Univ. Calif., Berkeley.

7795. Dale, J. E.

Leaf growth in *Phaseolus vulgaris*. 2. Temperature effects and the light factor. *Ann. Bot., Lond.*, 1965, **29**: 293-308, bibl. 16.

Results are reported for 2 experiments in which bean plants were grown in a range of day lengths from 1 hour to continuous illumination at temperatures of 15° C. and 25° C. Marked differences in total leaf area and in areas of individual leaves were found, and these were related in a quadratic fashion with total radiation received per day. With high levels of radiation a decrease in leaf area was noted, which could not be explained in terms of a simple nutritional hypothesis.

There were pronounced effects of total radiation on specific leaf area, but the mechanism by which these effects were brought about was not clear. The most important influence of temperature on the expansion of the leaf surface appeared to be: firstly, by controlling the rate at which leaves unfolded from the stem apex; and secondly, by controlling the partition of dry matter between the leaves and the rest of the plant. No effects of day length on vegetative development were found. [From author's abstract. For part 1 see *H.A.*, 35: 5688.]—Bot. Dep., Univ. Edinburgh.

7796. Horváth, I., and Szász, K.
Effect of light intensity on the metabolic pathways in photosynthesis. *Nature*, 1965, **207**: 546-7, bibl. 11.

In experiments on *Phaseolus vulgaris* var. Sugar Bean plants it was found that increasing the light intensity raised the relative carbohydrate content. This rise was steady in the starch and soluble carbohydrate fractions up to 2,000 lux; however, at 4,000 lux there was a dramatic increase in the starch fraction of the leaf and in the soluble carbohydrate fraction of the stem. The relative N contents of the plants decreased with increasing light intensity. This decrease appeared in the soluble N fraction, the level of protein N remaining constant with varying light intensity.—Univ. Agric., Gödöllő, Hungary.

7797. Belikov, P. S., and Avakimova, L. G.
Photosynthesis, water content and stomatal movement in excised bean leaves. [Russian.] *Izv. Timiriazev. sel'sk. Akad.*, 1965, No. 1, pp. 48-58, bibl. 54, illus.

Measurements were made on single leaves of 13- to 19-day-old plants raised in Knop's solution. The leaf was placed in an assimilation chamber under a light intensity of 7,000 lux provided by fluorescent lamps. The air was dried before it passed into the chamber. The rate of photosynthesis was measured with an infra-red gas analyser. When the photosynthesis rate was steady the petiole was cut 2 cm. from the lamina. There was a rapid loss of water from the leaf followed by a very slow loss. At the end of the experiment (after 210 min.) the leaf water content had fallen by 4%. After cutting, a short lag was followed by an increase and then a reduction in the rate of photosynthesis and in stomatal aperture. However, the changes in photosynthesis preceded the stomatal changes. Thus, the lag periods were 56 sec. and 4 to 5 min., respectively. The maximum photosynthesis rate was reached in 5 min. but the maximum stomatal aperture was not reached until about 15 min. The rate of photosynthesis regained its original level after about 20 min., whereas the stomatal aperture regained its original size after 50 to 55 min. At the end of the experiment, when the rate of photosynthesis had fallen to the compensation point, the stomata were still partially open. The authors conclude that the stomata and photosynthesis have different sensitivities to desiccation.

7798. Fletcher, R. A., Peterson, R. L., and Zalik, S.
Effect of light quality on elongation, adventitious root production and the relation of cell number and cell size to bean seedling elongation. *Plant Physiol.*, 1965, **40**: 541-8, bibl. 17, illus.

Phaseolus vulgaris plants exposed to blue and red light were shorter than those grown exclusively in blue. Removing the apex and leaving the cotyledons intact produced differences between hypocotyl lengths which were similar to intact plants exposed to blue and red light. The cotyledons were therefore essential for the differential light effects on elongation. The involvement of the red-far-red system in the initiation of adventitious roots was inferred. Moreover, there was evidence of a similarity in the response to blue and red-far-red light in seedling elongation and in the initiation of adventitious roots. The differences in elongation of petiole and hypocotyl sections of Dutch brown bean seedlings grown in light of several spectral regions were more closely related to the extent of cell elongation than to an increase in cell numbers. However, there was some relationship between epicotyl elongation and cell numbers. The lengths of the palisade cells were similar for all treatments, but palisade cells of the dark treatment were about half as thick as from the light treatments. The differences in leaf thickness could be accounted for by the differences in size of the intercellular spaces. [Authors' summary.]

7799. Fletcher, R. A., and Zalik, S.
Effect of light of several spectral bands on the metabolism of radioactive IAA in bean seedlings. *Plant Physiol.*, 1965, **40**: 549-52, bibl. 7, illus.

The metabolism of applied C^{14}-labelled IAA differed in bean plants grown under different regions of the spectrum; lower levels of IAA were recovered from red light-treated plants and a considerably greater concentration of a metabolite similar to indolealdehyde was found than in plants grown under blue light. A relationship between elongation and metabolism of radioactive IAA in plants exposed to different wavelengths of light was apparent. [From authors' summary.]—Univ. Alberta, Edmonton.

7800. Turner, W. B., and Bidwell, R. G. S.
Rates of photosynthesis in attached and detached bean leaves, and the effect of spraying with indoleacetic acid solution. *Plant Physiol.*, 1965, **40**: 446-51, bibl. 16.

The photosynthetic behaviour of attached and detached bean leaves when illuminated was similar except that the attached leaves exhibited a 10-minute lag phase following illumination. The rate of photosynthesis of a leaf rose to a sharp peak for a period of several hours concurrently with the breaking of dormancy of an axial bud. Similar peaks, but of about an hour's duration, were caused by spraying the leaf with solutions of IAA. This effect was not found in controls sprayed with water, nor was it a stomatal effect. [From authors' summary.]—Univ. Toronto, Ont.

7801. Brown, T. O., Kattan, A. A., and Sistrunk, W. A.
Yield and quality of snap beans for canning. *Arkans. Fm Res.*, 1965, **14**(2): 12.

Trials were conducted in 1964 on the effects of time of harvesting and irrigation on the yield and quality of 3 snap bean varieties. Harvesting began on 24 June and continued at 2-day intervals. On a total yield basis there was no advantage in waiting longer than the third harvest period for the varieties Gallatin 50 and XP-274 and the fifth period for Slimgreen; on an equivalent yield basis (after evaluation based on sieve size) these changed to the second harvest for the first 2 varieties and the third for Slimgreen. Supplementary irrigation throughout the season gave a 54% average increase in total and equivalent yields over no irrigation; this increase in yield was accompanied by a slower rate of pod maturation. Total and equivalent yields of Gallatin 50 and Slimgreen were less affected by irrigation than were those of XP-274. Irrigation was found to be the most important factor affecting yield, followed by time of harvest and variety. Variety exerted the greatest influence on quality, followed by harvest time and irrigation. Equivalent yield appeared to be a better index of when to harvest than total yield.

7802. TAKAYAMA, K. K., MUNETA, P., AND WIESE, A. C. **Lipid composition of dry beans and its correlation with cooking time.** *J. agric. Food Chem.*, 1965, **13**: 269-72, bibl. 22.

The triglyceride and phosphatide contents of 7 varieties or types of dry beans and the Alaska pea were determined. The triglyceride content ranged from 0·89% for Alaska peas to 1·54% for Michelite beans. The phosphatide content averaged about 1%, except for lima beans which averaged 0·88%. The main fatty acids of the triglycerides were palmitic, oleic, linoleic and linolenic. Small amounts of myristic acid were found in all varieties except Great Northern beans. Lauric acid was found in Alaska peas. The list of component fatty acids of the phosphatides was similar to the triglycerides, except for the omission of linolenic acid in the phosphatides of the Great Northern, Michelite, Pinto and lima beans. Palmitic acid constituted about 50% of the fatty acids in the phosphatides of the 8 types of beans and peas studied. No significant simple correlation coefficients were obtained between triglyceride, phosphatide or crude lipid content and the cooking time for the dry beans. [From authors' abstract.]—Univ. Idaho, Moscow.

Legumes—beans (Phaseolus species): diseases and pests.

(*See also* 7781.)

7803. MONEY, S. P. **Pests and diseases of beans.** *N.Z. J. Agric.*, 1965, **110**: 135, 137, 139, 141, bibl. 1, illus.

Symptoms on *Phaseolus* and broad beans, and control measures.

7804. SILBERNAGEL, M. J. **Differential tolerance to curly top in some snap bean varieties.** *Plant Dis. Reptr*, 1965, **49**: 475-7, bibl. 11.

Fifty-two snap bean varieties are rated according to their varying degrees of susceptibility to the virus.

7805. BELL, A. A. **Respiratory metabolism of *Phaseolus vulgaris* infected with alfalfa mosaic and southern bean mosaic viruses.** *Phytopathology*, 1964, 54: 914-22, bibl. 29.

Wounding stimulated respiration and the utilization of exogenous glucose to such a degree that wounded controls were necessary to validate results obtained from studies of respiration of virus-infected tissues. Under controlled environmental conditions, the respiration of virus-infected plants increased directly with the manifestation of symptoms and increases of viral titre. The percentage recovery of $C^{14}O_2$ from glucose-C^{14} and the anaerobic : aerobic ratio of CO_2 evolution also increased during accumulation of infectious virus in virus-infected tissues compared with healthy tissue. Respiration was stimulated most in local lesion and least in systemic plant-virus combinations, although increases occurred in all virus-infected tissues. Increased respiration of the variety GN59 infected with SBMV, a local-lesion combination, appeared largely to result from greater activity of the pentose phosphate shunt. The margin of increase was insensitive to glycolysis inhibitors, sodium fluoride and iodoacetate, and the C_6/C_1 ratio of recovery of $C^{14}O_2$ from glucose-6-C^{14} and glucose-1-C^{14} was markedly decreased. Recovery of the C_1, but not the C_6, carbon of glucose was increased, indicating increased glucose-6-phosphate and 6-phosphogluconate dehydrogenase activities. Increased pentose phosphate metabolism did not seem to occur in plant tissues responding by other symptoms to viral infections. [From author's abstract.]—Univ. Md, College Park.

7806. SHINDE, B. G., CHANDRASEKHAR, B. K., AND SANTILLI, V. **Distribution of ribonuclease in subcellular fractions of untreated, wounded, and TMV infected Pinto bean leaves.** From abstr. in *Phytopathology*, 1964, **54**: 908.

Homogenates from wounded leaves showed 29–80%, and TMV-infected leaves showed 100–225%, greater ribonuclease activity than did untreated control homogenates. Ribonuclease activity of homogenates after removal of the total particulate fraction by centrifugation was not affected or was decreased slightly. Total particulate, chloroplast, mitochondrial and microsomal fractions showed some activity. One wash with sucrose-phosphate buffer removed all or most of the activity of the particulate fractions. Sonication, deoxycholate, urea and sodium lauryl sulphate did not increase the activity of the washed particulate fractions. These results suggest that the large specific increases in ribonuclease activity arise from new synthesis of enzyme rather than by release from the particulate fraction. [See also *H.A.*, 32: 4886.]—St. Univ. N.Y., Buffalo.

7807. LIPPINCOTT, J. A., AND HEBERLEIN, G. T. **The induction of leaf tumors by *Agrobacterium tumefaciens*.** *Amer. J. Bot.*, 1965, **52**: 396-403, bibl. 30, illus.

After light rubbing with carborundum and a culture of *Agrobacterium tumefaciens* bean and tobacco leaves developed tumours on the lamina. Their development is described. The tumours were shown to differ from IAA-induced leaf proliferations with respect to their point of origin on the leaf, morphology, physiology and development. [From authors' abstract.]—Northwestern Univ., Evaston, Ill.

7808. WALKER, J. C., AND PATEL, P. N. **Inheritance of resistance to halo blight of bean.** *Phytopathology*, 1964, **54**: 952-4, bibl. 4.

The resistance of the Red Mexican U.I.3 bean variety to race 1 of *Pseudomonas phaseolicola* was shown to be inherited as a monogenic dominant. [For earlier work see *H.A.*, 32: 4887.]

7809. PATEL, P. N., AND WALKER, J. C. **Reactions of *Phaseolus* spp. to two races of *Pseudomonas phaseolicola* and a brown-spot organism.** From abstr. in *Phytopathology*, 1964, **54**: 903.

In greenhouse studies lines of 16 *Phaseolus* spp. were tested for reaction to races 1 and 2 of *Pseudomonas phaseolicola*. Resistant and susceptible species are listed. Of 400 lines of *P. vulgaris* tested, about 65% were susceptible, 20% were completely resistant and 15% were segregating for resistance to race 1. None was completely resistant to race 2, but a line from El Salvador, P.I. 150,414, showed high tolerance. Of 35 Red Mexican, Great Northern, Pinto, Navy and kidney field-bean varieties tested, 12 were resistant to race 1 but none was resistant to race 2. All 52 snap bean varieties tested were susceptible to both races. Parallel studies with the recently isolated bacterial brown spot organism, using one line of each of the above *Phaseolus* spp., showed all lines to be susceptible, but symptoms were less severe on *P. angularis* than on other species.—Univ. Wis., Madison.

7810. Epton, H. A. S., and Deverall, B. J.
Physiological races of *Pseudomonas phaseolicola* causing halo blight of bean. *Plant Path.*, 1965, **14**: 53-4, bibl. 1.

Races 1 and 2 shown to occur in the United Kingdom.

7811. Rudolph, K.
Analysis of proteins and enzymes of the interaction between *Phaseolus vulgaris* and *Pseudomonas phaseolicola* (halo blight of beans). From abstr. in *Phytopathology*, 1964, **54**: 904-5.

Changes in protein pattern and enzyme activity following infection. [See also *H.A.*, 35: 1031.]

7812. Hoitink, H. A. J., Coulson, J. G., and Pelletier, R. L.
A halo-inducing toxin in culture filtrates of *Pseudomonas phaseolicola*. From abstr. in *Phytopathology*, 1964, **54**: 895.

Characteristic halos of *P. phaseolicola* were induced on bean leaves injected with sterile culture filtrates. Starch accumulated in halos resulting from infection as well as from filtrates. The width of the halos induced by isolates differing in virulence was comparable whether the leaves were inoculated with washed bacterial suspensions or injected with sterile culture filtrates. There was a positive correlation between filtrate concentration and area of chlorosis induced, but no correlation with the degree of chlorosis. Spraying leaves with kinetin reduced the size of halos induced by inoculation, but gave inconsistent results on leaves treated with filtrate. The toxin was not host-specific.—McGill Univ., Montreal.

7813. Wallen, V. R., and Sutton, M. D.
***Xanthomonas phaseoli* var. *fuscans* (Burkh.) Starr & Burkh. on field bean in Ontario.** *Canad. J. Bot.*, 1965, **43**: 437-46, bibl. 14, illus., and *Greenhouse, Garden, Grass*, 1965, **5**(1): 4-8, illus.

Fuscous blight, a new disease of field beans in Canada, was found to be present in a high proportion of bean seed samples from southwestern Ontario. The symptoms are described. Garden varieties were generally more susceptible than field varieties. Great Northern showed the highest degree of resistance of all the varieties tested. [From authors' abstract. See also *H.A.*, 35: 1032.]

7814. Taylor, G. S., and Parkinson, D.
Studies on fungi in the root region. IV. Fungi associated with the roots of *Phaseolus vulgaris* L. *Plant and Soil*, 1965, **22**: 1-20, bibl. 30.

A table is provided showing the relative importance of the most common species isolated in each of 4 clearly distinct micro-habitats, viz. the root surface, the cortex, the outer stele and the inner stele. *Fusarium oxysporum* and *Cylindrocarpon radicicola* were the fungi most frequently isolated. [From authors' summary. For part III see *H.A.*, 34: 4915.]

7815. Bannerot, A.
Résultats de l'infection d'une collection de haricots par six races physiologiques d'anthracnose. **(Results of the infection of a collection of beans by six physiological strains of anthracnose.)** [English and German summaries 19 and 21 lines.] *Ann. Amél. Plantes*, 1965, **15**: 201-22, bibl. 24, illus.

430 bean varieties, mostly pure lines, were infected separately with 6 strains of anthracnose (*Colletotrichum lindemuthianum*). The varieties were classified according to their response to each strain. Five sources of apparently complete resistance were present. One of these is Cornell 49,242, which is already known and used in breeding.—Cent. nat. Rech. agron., Versailles.

7816. Hovadík, A.
Odolnost některých odrůd světového sortimentu fazolu vůči antraknóze hodnocená obsahem antibioticky účinných látek semen inhibujících růst houby *Colletotrichum lindemuthianum* (Sacc. et Magn.) Br. et. Cav. **(An evaluation of the resistance to anthracnose in some bean varieties based on the content of antibiotic substances in the seeds inhibiting the growth of the fungus *Colletotrichum lindemuthianum*.)** [English, Russian and German summaries ¼ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 83-92, bibl. 20, illus.

Seed extracts of 13 out of 84 bean varieties tested strongly inhibited mycelial growth. Extracts of 16 varieties stimulated mycelial growth, thereby indicating high susceptibility to anthracnose.

7817. Williams, F. J.
Factors affecting the incidence of hypocotyl collar rot of *Phaseolus vulgaris*. Abstr. in *Phytopathology*, 1965, **55**: 506.

Disease incidence in 65 lots of Tendercrop seed varied from 2 to 56% when germination occurred in upright, rolled paper towels that had been wetted with distilled water. When the germination temperature was varied from 20 to 40° C. at 5° intervals, the highest disease incidence was at 30°. The disease incidence from a given seed lot was high when germination occurred in washed sand or paper towels wetted with distilled or tap water. The incidence was significantly lower when germination occurred in unwashed sand, a mixture of 500 ml. of washed sand and 40 ml. of Attaclay, or mixed greenhouse soil. Wetting the paper towels with a 0·01 M solution of K_2SO_4, $MnSO_4$, $MgSO_4$, $Ca(NO_3)_2$, $CaCl_2$ or $CaSO_4$ lowered disease incidence in comparison with the distilled water control. Ca compounds were equally and more effective than the other compounds in lowering incidence.—Univ. Md, Coll. Park.

7818. Wester, R. E., and Goth, R. W.
Pathogenicity of *Rhizoctonia solani* on lima bean seedlings. Abstr. in *Phytopathology*, 1965, **55**: 506.

Seed-coat damage increased the susceptibility of Fordhook 242 lima bean seedlings to a root rot caused by *Rhizoctonia solani*. Apparently seed-coat cracks in the germinated seed provided an avenue of entrance for the pathogen, which colonized the cotyledon during the germination period. This resulted in the death of many seedlings just as the plumule and radicle emerged. A higher percentage of damping-off of seedlings occurred when seeds were planted in autoclaved composted soil at a depth of 3 in. compared with 1 in.—U.S. Dep. Agric., Beltsville, Md.

7819. Bateman, D. F., and Lumsden, R. D.
Relation of calcium content and nature of the pectic substances in bean hypocotyls of different ages to susceptibility to an isolate of *Rhizoctonia solani*. *Phytopathology*, 1965, **55**: 734-8, bibl. 20.

Hypocotyl tissue of Red Kidney bean was highly susceptible to *Rhizoctonia solani* (isolate R-B) during the first 2 weeks of plant growth, moderately resistant during the third week, and resistant thereafter. The changes in resistance were associated with elongation and maturation of the hypocotyl and concomitant changes in the pectic substances and Ca content. The Ca content of 4-, 16-, and 32-day-old hypocotyls was 0·38, 1·92, and 1·92%, respectively. The anhydrouronic acid content of hypocotyls assayed at 4-day intervals between 8 and 32 days was about 4% on a dry weight basis; the saponifiable methoxyl group content was 0·5, 0·3, and 0·2% in 8-, 16-, and 32-day-old tissue, respectively. These results indicate a conversion of pectin to pectate during maturation of bean hypocotyl. Hypocotyl tissue of 7-day-old seedlings was macerated in 2 hours by polygalacturonase from *Rhizoctonia*-infected tissue. Fifteen-day-old tissue, but not 31-day-old tissue, was macerated within 6 hours. These results support the hypothesis that increased resistance of bean hypocotyl tissue to *R. solani*, during the processes of tissue maturation, is associated with conversion of pectin to Ca pectate, which renders the pectic materials resistant to polygalacturonase. [Authors' abstract.]—Cornell Univ., Ithaca, N.Y.

7820. Crossan, D. F.
Field and greenhouse experiments for control of *Rhizoctonia* root rot of snapbean. Abstr. in *Phytopathology*, 1965, **55**: 503.

In 2 experiments 30 days apart on the same site in 1963, Terraclor applied as an in-the-furrow spray (5 lb./acre) failed to control *Rhizoctonia* root rot of snapbean when the soil was very dry at seeding, but gave satisfactory control when the soil was moist. In an evaluation of several candidate soil fungicides in 1964, Hercules 13274 and Lanstan controlled root rot as well as, or better than, the Terraclor standard. In greenhouse trials, using naturally or artificially infested soils, seeding 3 in. deep consistently resulted in a greater amount of pre-emergence decay and severe root rot than seeding 1 in. deep. Terraclor applied in-the-furrow over seed planted 3 in. deep gave relatively poor root rot and stem lesion control compared with similar treatment of seed 1 in. deep. [See also *H.A.*, 33: 5114.]—Univ. Delaware, Newark.

7821. Baggett, J. R., Frazier, W. A., and Vaughan, E. K.
Tests of *Phaseolus* species for resistance to *Fusarium* root rot. *Plant Dis. Reptr*, 1965, **49**: 630-3, bibl. 17, illus.

All lines of 14 *Phaseolus* species tested were susceptible to *F. solani* f. *phaseoli*.

7822. Huber, D. M., and Andersen, A. L.
Characteristics of resistance to *Fusarium* root rot of bean. Abstr. in *Phytopathology*, 1964, **54**: 896.

Resistance to *Fusarium solani* f. *phaseoli* as found in N203958, a *P. vulgaris* introduction, and in *P. coccineus* was compared with the susceptible bean varieties Sanilac, Dark Red Kidney and Red Mexican. Resistance was characterized by a non-specific wound response in the cortex. High enzyme activity around the infection site was observed first, then a rapid deposition of wound substances, and finally, in 4 to 5 days, a wound periderm was formed. Only erratic cell division occurred in the susceptible plants, and the deposition of wound substances was slow. The endodermis, phloem, cambium and xylem, which are resistant to *Fusarium* in both susceptible and resistant plants, and the resistant response observed in N203958 and *P. coccineus* were characterized histochemically. Peroxidase, tyrosinase, and β-glucosidase were more active in the resistant than in the susceptible tissues following infection. [See also *H.A.*, 35: 1037.]—Mich. St. Univ., E. Lansing.

7823. Hyre, R. A.
Effect of temperature on colonization of lima beans by *Phytophthora phaseoli*. From abstr. in *Phytopathology*, 1964, **54**: 897.

Starting 18 hours after inoculation with *P. phaseoli* exposures were made to 86°, 89°, 92° and 95° F. for 4 hours per day. When they were not being exposed to high temperature, all the plants were held in 12 hours of light at 80° alternating with 12 hours of dark at 70°. Colonization decreased as the temperature and/or the number of exposures was increased, but it did not cease. With 1–7 exposures to 95° the lesions were significantly shorter than were the control lesions. However, after 7 daily exposures to 95° the lesions were still about one-third the length of the control lesions. When exposed to 86° for 1–7 days the lesions were not significantly shorter than were control lesions. In other tests, colonization was significantly less after 6-hour daily exposures to 92° than after 4-hour daily exposures. The mean length of stem lesions was 20 and 34 mm., respectively, when 6 exposures were made. Within the limits of these tests, short exposures of infected beans to high temperature can be expected to reduce colonization but not to eliminate possible future losses from the disease. [See also *H.A.*, 33: 3007.]—U.S.D.A., Pa St. Univ., Univ. Park.

7824. Hendrix, J. W., Daly, J. M., and Livne, A.
Pyridine nucleotide-linked enzymatic reduction of triose, pentose, and hexose phosphates associated with rust infection. From abstr. in *Phytopathology*, 1964, **54**: 895.

Activity became detectable at the early flecking stage and rapidly increased until sporulation began. Activity was not proportional to pustule intensity in beans.

7825. Staples, R. C.
Effect of removing the terminal bud of bean plants upon protein changes after infection by the bean rust fungus. Abstr. in *Phytopathology*, 1964, **54**: 909.

The protein content of primary leaves of unpruned Pinto bean plants decreased slowly with age to about half the initial value, whereas it increased nearly 7-fold in leaves from plants having the terminal bud removed. After infection with *Uromyces phaseoli*, the protein content of primary leaves from unpruned plants increased relative to non-infected controls, but decreased if the terminal bud was pruned. Changes in specific activity of acid phosphatase parallelled those of protein in both unpruned and pruned plants. Acid phosphatase decreased in all parts of pruned plants after infection, but increased only in the leaf in unpruned infected plants. The data are in accordance with the current hypothesis that rust infections compete with the growing point of the host plant for nutrients. Only when secondary growth is present do proteins and enzymes accumulate in rusted leaves. The physical properties of acid phosphatase from rusted leaves were apparently not altered.—Boyce Thompson Inst., Yonkers, N.Y.

7826. ZAKI, A. I., AND DURBIN, R. D.
The effect of bean rust on the translocation of photosynthetic products from diseased leaves. *Phytopathology*, 1965, **55**: 528-9, bibl. 12.

At various times after inoculation of primary bean leaves with *Uromyces phaseoli* var. *typica*, $C^{14}O_2$ was administered to them in the light. As the healthy leaf aged an increasing proportion of the total fixed C^{14} was translocated, predominantly to the shoot apex. Diseased leaves, however, retained substantially more C^{14}, especially at the expense of the shoot apex and roots. Root dry weight increase was also significantly reduced when either the primary or first trifoliate leaves were infected. [From authors' abstract. See also *H.A.*, 33: 3009.]—Univ. Minn., St. Paul.

7827. ZAKI, A. I., AND MIROCHA, C. J.
Respiration, photosynthesis, and dark fixation of $C^{14}O_2$ by healthy and rusted bean leaves. Abstr. in *Phytopathology*, 1964, **54**: 913.

Bean plants were grown under controlled conditions and inoculated with race 32 of *Uromyces phaseoli typica*, respiration, apparent photosynthesis and dark fixation of $C^{14}O_2$ being measured daily for 7 days following inoculation. The rate of respiration (O_2 uptake in the dark) of infected leaves was similar to that of healthy leaves until the fifth day (fleck stage), when it increased 2·5 times. The rate of O_2 production in the light did not differ significantly from that of healthy plants. Enhanced dark fixation of $C^{14}O_2$ at infection sites was detected by autoradiography as early as the fourth day after inoculation, before symptom development. The specific activity of infected leaves 7 days after inoculation was about 4·5 times higher than that of healthy leaves when determined by combustion analyses. The $C^{14}O_2$ fixed in the dark was not translocated out of the infected leaf. From 5 to 7 days after inoculation the respiration rate of the infected leaves increased, but photosynthesis remained essentially the same. Contrary to expectation, the dry weight of infected leaves increased during this time. At least part of the increase in dry weight of infected tissue could be due to enhanced dark fixation of $C^{14}O_2$.—Univ. Minn., St. Paul.

7828. PEGG, K. N.
Bean *Sclerotinia* control. *Qd agric. J.*, 1965, **91**: 262-4, illus.

Good control of *Sclerotinia sclerotiorum* on french beans was obtained with dichloran (2,6-dichloro-4-nitroaniline). Weekly sprays of 2 lb. 50% a.i./100 gal. from blossom-fall to first picking prevented infection in the field, and a post-harvest dip of 1½ lb. 50% a.i./100 gal. prevented its development in market consignments.

7829. BECKMAN, K. M., AND PARSONS, J. E.
Fungicidal control of *Sclerotinia* wilt in green beans. *Plant Dis. Reptr*, 1965, **49**: 357-8, bibl. 5, illus.

The application of 2,6-dichloro-4-nitroaniline at 3 or 6 lb. a.i. per acre to the base of the plants effectively controlled *S. sclerotiorum* and *Botrytis cinerea* on runner beans.

7830. ECHANDI, E.
Basidiospore infection by *Pellicularia filamentosa* (= *Corticium microsclerotia*), the incitant of web blight of common bean. *Phytopathology*, 1965, **55**: 698-9, bibl. 6, illus.

Inoculation of the terminal bud and primary leaves of beans with basidiospores of *P. filamentosa* was effective in causing web blight.—Inter-Amer. Inst. agric. Sci., Turrialba, Costa Rica.

7831. STONE, M. W.
Biology and control of the lima-bean pod borer in southern California. *Tech. Bull. U.S. Dep. Agric.* **1321**, 1965, pp. 46, bibl. 23, illus.

Of the 54 insecticides tested against the pod borer (*Etiella zinckenella*) on lima beans from 1958 to 1962, carbaryl at 2 lb. actual/acre/application (3 or 4 applications) was the most effective, with an average of 80% reduction in pod injury. Carbaryl was also effective against the corn earworm (*Heliothis zea*) and gave fair to good control of lygus bugs. Its main disadvantage was that it increased infestations of the two-spotted spider mite (*Tetranychus telarius*) on beans. Guthion and Zectran applied at 1½ or 2 lb. actual/acre/application (3 or 4 applications) gave good control of both the pod borer and lygus bugs. [From author's summary.]

Legumes—beans (Vicia faba).

(*See also* 6897, 6899, 7803, 7841.)

7832. DAVIDSON, D.
Cytological chimaeras in roots of *Vicia faba*. *Bot. Gaz.*, 1965, **126**: 149-54, bibl. 7.

Roots of *Vicia faba* that had been treated with colchicine (0·05% aqueous solutions) had meristems containing diploid and polyploid cells. Lateral roots grew from C-tumours and from regenerated primary roots. Secondary laterals grew from the lateral roots on the C-tumours. The composition of the apical meristems of primary, lateral and secondary lateral roots has been determined. The mean percentage of polyploid cells in lateral roots is greater than in primary roots: the difference between means is 50%. It appears that roots that arise after treatment with colchicine have mixoploid meristems and develop from mixoploid primordia. Mixoploid lateral roots appear to be stable cytological chimaeras in which cells with different degrees of ploidy are distributed throughout the meristem. [Author's abstract.]—Univ. St. Andrews, Scotland.

7833. DAVIDSON, D.
A differential response to colchicine of meristems of roots of *Vicia faba*. *Ann. Bot., Lond.*, 1965, **29**: 253-64, bibl. 16, illus.

In whole root systems of *Vicia faba*, including primaries and laterals, the meristems do not respond in a uniform manner to treatment with colchicine. The meristems of the primary and fully emerged lateral roots become mixoploid and these roots show a temporary inhibition of growth. Lateral roots that emerge within 48 hours of treatment show no effects of colchicine; their growth is not inhibited and they contain few or no polyploid cells. The cells of the primordia that produce these laterals appear to be insensitive to colchicine; at the insensitive stage these primordia contain at least 1,000 cells. Primordia with less than 800 cells are very sensitive to colchicine. They do not recover from treatment and appear to be completely inhibited. The stages of extreme sensitivity and resistance are transient phases in the morphogenesis of a lateral root. The change in sensitivity to colchine is accompanied by a fall in the mitotic index; this is highest in young primordia, where it is about twice the value found in growing laterals. [Author's abstract.]—Univ. St. Andrews.

7834. Nemec, B.
Interaktion zwischen diploiden und polyploiden Zellen. (**Interaction between diploid and polyploid cells.**) [Czech and Russian summaries ¼ p. each.] *Biol. Plant., Prague*, 1965, **7**: 246-50, bibl. 10, illus.

In young roots of *Vicia faba* there was no interaction within the mixoploid tissue, growth, division and differentiation proceeding normally. Later, however, especially when the root apices contained much polyploid tissue (8n and 16n), these reacted against each other. The polyploid cells ceased division and elongation and became separated from the other tissue.

7835. Lilly, L. J.
Induction of chromosome aberrations by aflatoxin. *Nature*, 1965, **207**: 433-4, bibl. 12.

Roots of broad bean seedlings were immersed for 3 hours in a $6\cdot7\times10^{-4}$M solution of aflatoxin at pH 5·8 and 21° C. Control roots were treated with water for 3 hours. All plants were then returned to the culture tank where they grew in water, and the roots were fixed in acetic alcohol after periods ranging from 3 to 72 hours. There was a highly significant increase in the number of abnormal anaphases following aflatoxin treatment, and a considerable inhibition of mitosis.—Middx Hosp. med. Sch., Lond.

7836. Davidson, D.
RNA synthesis in roots of *Vicia faba*. Reprint from *Exp. Cell Res.*, 1964, **35**: 317-25, bibl. 28.

An examination of dividing cells in the roots of *V. faba* grown in solutions containing tritium-labelled cytidine and uridine showed that RNA was synthesized in the nuclei during interphase and in early and middle prophase, but not during mitosis. In late prophase this nuclear RNA passed into the cytoplasm on the breakdown of the nuclear membrane, very little of it appearing in the chromosomes.—Oak Ridge nat. Lab., Tenn.

7837. Gahan, P. B.
Histochemical evidence for the presence of lyosome-like particles in root meristem cells of *Vicia faba*. *J. exp. Bot.*, 1965, **16**: 350-5, bibl. 14, illus.

7838. Buishand, T.
Vroege tuinbonen voor vers gebruik. (**Early broad beans for fresh use.**) *Groent. en Fruit*, 1965, 20: 1317, illus.

Seed was sown from the end of January to early February under glass for March planting. Removing the top 5 cm. after the flowers had set had little effect on earliness or yield; when the top 25–30 cm. was removed there was a slight advance in earliness but a reduction in yield, as in the 1963 trials. Two types—long pod (4–5 seeds) and short pod (3–4 seeds)—were grown. The most suitable variety for early cropping was Futura. Good control of aphids was essential to prevent the spread of virus yellows and mosaic. [See also *H.A.*, 34: 4784.]—Proefstat. Groent., Alkmaar.

7839. Boyce, W. R.
Weed control in broad beans and potatoes at Levin—1962. *Proc. 16th N.Z. Weed Control Conf., 1963*, pp. 55-9.

Simazine and ipazine at 0·75, 1·25 and 1·75 lb./acre applied 6 days after sowing 2 varieties of broad beans gave satisfactory control of annual weeds. The variety Cole's Early Dwarf was damaged by all treatments, but the yields of Exhibition Long Pod were not reduced by the 2 lower rates of ipazine.—Hort. Res. Stat., Levin, N.Z.—From *Weed Abstr.*, **14**, No. 74.

7840. Millikan, C. R., and Hanger, B. C.
Effects of chelation and of certain cations on the mobility of foliar-applied ^{45}Ca in stock, broad bean, peas and subterranean clover. *Aust. J. biol. Sci.*, 1965, **18**: 211-26, bibl. 27, illus.

A series of water-culture experiments was conducted using normal- and low-Ca nutrient solutions. Leaves were either injected or surface-treated with an aqueous solution of $Ca^{45}Cl_2$, with and without various additions. The subsequent distribution of Ca^{45} in the plants was determined by means of radioautographs and radioassays. In each species, where nothing was added to the dose, there was negligible movement of Ca^{45} from the treated leaf. With broad bean and common stock, the addition of small amounts of EDTA (disodium salt) or HCl or both, or of citric acid, caused marked acropetal movement of Ca^{45} in both normal and Ca-deficient plants. Marked accumulation of Ca^{45} occurred in the epidermal hairs and anthers of common stock. There was also some evidence of retranslocation of Ca^{45} in this species.—Dep. Agric., Burnley, Vict.

Legumes—peas: varieties, culture, physiology and composition.

(*See also* 6851, 6852, 6895, 6901, 6906-6908, 6926, 7782, 7802.)

7841. Pea Growing Research Organisation Ltd, Yaxley.
Annual Report, 1964, 1965, pp. 27, 1s. 6d.

Current investigations are described (pp. 11-19) as follows: Vining and canning pea variety trials; weed control; spatial arrangement in vining peas; varietal susceptibility to downy mildew (*Peronospora viciae*), fusarium wilt (*Fusarium oxysporum*) and early browning virus; root eelworm rotational experiment; winter hardy varieties; influence of varieties, dates of cutting, position on loaded 4-poles, foliar applications of phosphate and desiccation on the evenness of texture of dried peas; taint tests on herbicide-treated peas; dwarf bean variety trials; spatial arrangement and herbicide trials on dwarf beans; broad bean variety and overwintering trials; and variety trials on runner and climbing french beans.

7842. Sugahara, Y., Suzuki, I., and Murata, N.
Breeding canning peas. I. The yield and canning quality of foreign varieties. [Japanese, with English summary ½ p.] *Bull. hort. Res. Stat. Shizuoka, Ser. B (Okitsu)*, 1965, No. 4, pp. 45-91, bibl. 21, illus.

Seven years' field trials on 30 introduced varieties are reported. The productivity and adaptability of most of the lines were inferior to those of Japanese commercial varieties, but the sweet varieties were more suitable for canning. The varieties Oracle, Provost and

World Record are recommended as overwintering peas for areas of Japan with mild winters.

7843. Singh, J. P., and others.
Functional male-sterile mutant in peas (*Pisum sativum* L.). *Indian J. Hort.*, 1964, **21**: 247-8, bibl. 3, illus.

A description is given of a mutant observed among plants grown at the Vegetable Breeding Substation, Katrain, Kulu Valley, in the hybridization programme aimed at obtaining an early, high-yielding variety suitable for cultivation in the hilly regions.

7844. Polunin, Ja. Ja.
The new pea variety VIR 344-4. [Russian.] *Agrobiologija*, 1965, No. 1, pp. 82-5.

The variety VIR 344-4 flowered 5–6 days later than the variety Kapital, ripened earlier and gave considerably higher yields.

7845. King, J. M.
Weeds in peas. *Agriculture, Lond.*, 1965, **72**: 181-4.

Trials of pre-emergence herbicides on various soils are reported. Neburon and chloroxuron were particularly effective on medium and light soils. Chloramben (Amiben) gave good weed control on organic peat soils but was unreliable on mineral soils. Prometryne appears the most promising pre-emergence herbicide for both light and heavy clay soils.—Pea Grg Res. Org.

7846. Cantăr, F., Comarovschi, G., and Vasilică, C.
Studiul eficacităţii unor erbicide selective la mazăre. **(The effectiveness of some selective herbicides in peas.)** [French and Russian summaries ½ p. each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 91-6, bibl. 4.

Of 4 herbicides tested in 1962 and 1963 as pre-emergence sprays in peas, A.1114 [a triazine derivative] proved the most effective, giving a 77% kill of noxious weeds and an average yield increase of 25·3% over that of the untreated plots. A rate of 4 kg./ha. was the most suitable and did not injure the peas.

7847. Hotjanovič, A. V., and Vedeneeva, N. A.
Effect of the herbicide 2,4-D on the proteins of pea seedlings. [Russian, with English summary 5 lines.] *Fiziol. Rast.*, 1965, **12**: 158-63, bibl. 19.

Pea seedlings were raised in half-strength Knop's solution in the dark. Centimetre sections of the stem of 2-week-old seedlings were immersed in a 0·07% solution of 2,4-D for 16 to 19 hours. In some cases the 2,4-D was labelled with C^{14}, and in others methionine-S^{35} was introduced. Treatment with 2,4-D reduced the degree of coagulation of the proteins at 100° C. and also reduced the total amount of protein salted out by $(NH_4)_2SO_4$, though it increased the amounts salted out at the lower concentrations of $(NH_4)_2SO_4$. 2,4-D reduced the incorporation of methionine into the proteins and also reduced the proteolytic enzyme activity of the tissue. No stable compounds of 2,4-D and proteins were found.

7848. Haken, D.
Učinnosˇ medi na rašelinových pôdach. **(The effectiveness of copper on peat soils.)** [English and Russian summaries ½ p. each.] *Pol'nohospodárstvo*, 1965, **11**: 91-6, bibl. 15.

In pot experiments on moorland soil applications of copper sulphate significantly increased the yield of pea seeds and slightly improved the growth of hemp plants. The most effective rate of application for peas was 3–30 mg. Cu/kg. of soil, and for hemp 30 mg. Cu/kg. of soil. The Cu content of the plants increased with increasing rates of application.

7849. Popescu, I., and Afusoae, I.
Repartiţia manganului, molibdenului şi cuprului în diferite organe ale cîtorva plante de cultură. **(The distribution of manganese, molybdenum and copper in the different organs of some cultivated plants.)** [French and Russian summaries ½ p. each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 107-19, bibl. 15.

The plants, which included peas, were grown in soils enriched in Mn, Mo and Cu. Manganese accumulated to a greater extent than the other elements. There was a marked rise in the Mo contents of the seeds and young plants, and Cu concentrations in the leaves and older haulms were greatly increased.

7850. Hagstrom, G. R., and Berger, K. C.
Molybdenum deficiencies of Wisconsin soils. *Soil Sci.*, 1965, **100**: 52-6, bibl. 14.

Canning peas were grown on a soil of pH 5·3 containing 0·42 p.p.m. of oxalate-extractable Mo. Yields were increased 98% by the application of 2 oz. sodium molybdate per acre as a wet seed dressing. A foliar spray treatment at the same rate was equally effective, but a dry seed dressing was much less so. Lime broadcast at seeding time at 2,000 lb./acre did not significantly increase yields. The N content of the pea vines was increased by the Mo treatments.—Univ. Wis.

7851. Noser, M., and Petrov-Spiridonov, A. E.
Influence of temperature, shading and pH of the nutrient solution on the absorption of mineral nutrient elements and the content of sugars and free amino acids in maize and peas. [Russian.] *Izv. Timirjazev. sel'sk. Akad.*, 1965, No. 1, pp. 59-70, bibl. 58.

The plants were raised in nutrient solution at a temperature of 23° C., under an illumination of 5,200 lux and with a light period of 14 hours. The pH was maintained between 5·4 and 5·6. The experiments lasted for 72 hours and the treatments consisted of continuous darkness imposed for 24, 48 or 72 hours, low (13°) and high (33°) temperatures, and low (4·7) and high (7·2) pH. The following results were obtained with 22-day-old pea plants. Prolonged darkness increased the uptake of Ca and reduced the uptake of K. During the first 24 hours of darkness P and K were excreted into the solution. The uptake of Mg was increased at first, but eventually Mg was excreted. The amino acid content of the roots and shoots increased during darkness and the transfer of sugars from shoots to roots was increased. At 13° the uptake of K and P was reduced and the uptake of Ca and N was increased during the first 24 hours; by the end of the experiment the uptake of these elements was similar to that of the control plants; Mg was excreted at the beginning and end of the experimental period. After 24 hours at 33° the uptake of Ca and K was reduced and the uptake of Mg and N was stimulated; at the end of the experiment the uptake of all the elements except P was reduced. Both low and high temperatures caused the accumulation of free amino acids and accelerated the flow of sugars from shoots to roots. After 24 hours at pH 4·7 the uptake of N and Mg were greatly increased, whereas P and K were excreted. The uptake of Ca was increased at pH 7·2. At pH 4·7 the amino acid content of the roots decreased and that of the shoots increased, whereas at pH 7·2 the amino acid content increased in the roots and decreased in the shoots. At pH 4·7 the sugar content of the roots and shoots was only about 50% of that in the control plants. A pH of 7·2 increased the sugar content of the roots and reduced that of the shoots. An analysis of the effects of the treatments on the contents of individual amino acids in the roots and shoots is also given.

7852. Salter, P. J., and Drew, D. H.
Root growth as a factor in the response of *Pisum sativum* L. to irrigation. *Nature*, 1965, **206**: 1063-4, bibl. 10.

Studies were conducted on the determinate variety Dark-skinned Perfection to ascertain whether root growth in peas was correlated with their differential response to irrigation at different stages of growth. Root studies were made through glass panels both in containers in the laboratory and in an observation trench in the field. Root growth was seen to increase rapidly, reaching a maximum just after the initiation of the first flower primordia. Shortly afterwards, and before the first flowers opened, the amount of new root growth declined sharply and this was accompanied by the death of many of the older roots. At the start of pod development a slight resurgence of root growth was observed, but the amount of new growth made as the pods began to swell was small and growth stopped as the pods matured.—Nat. Veg. Res. Stat., Wellesbourne, Warwick.

7853. Digby, J., and Wangermann, E.
A note on the effect of the shoot and root apex on secondary thickening in pea radicles. *New Phytol.*, 1965, **64**: 168-70, bibl. 7.

The effects of excision of the root or shoot apices of young pea seedlings, and of their replacement with auxin paste, suggest that cambial activity in the root is stimulated by auxin coming from the shoot, and that auxin from the root apex either does not travel to the older parts of the root or has no effect on cambial activity. [Authors' summary.]—Univ. Coll. Wales, Aberystwyth, and Univ. Leicester.

7854. Dostál, R.
Symmetry in the *Pisum* seedling and growth regulators. [Czech and Russian summaries 5-6 lines each.] *Biol. Plant., Prague*, 1965, **7**: 308-17, bibl. 13, illus.

The bilateral symmetry and unilateral position of the cotyledons are determined by their equal development and by the dorsiventral position of the epicotyl and root, respectively, and are related to the distribution of auxin from the cotyledons, which may be enhanced by exogenous growth substances such as IAA, GA$_3$ and TIBA. [From author's abstract.]—Coll. Agric., Brno.

7855. Šebánek, J.
The interaction of endogenous gibberellins in correlation with cotyledons and axillary buds in the pea (*Pisum sativum* L.). *Biol. Plant., Prague*, 1965, **7**: 194-8, bibl. 8.

After decapitation and amputation of one cotyledon in germinating pea seedlings, the axillary bud of the amputated cotyledon always grows and the growth of the axillary bud of the remaining cotyledon is inhibited. Before morphological differences appear between the axillary bud of the amputated and preserved cotyledon, a higher endogenous gibberellin content can be demonstrated chromatographically in the axillary bud of the amputated cotyledon. This indicates that the increased growth of the axillary bud of the amputated cotyledon is connected with an earlier increase in the activation of endogenous gibberellins. [Author's summary. See also *H.A.*, 34: 2003 and 6138.]—Agric. Coll., Brno.

7856. Moore, T. C.
Effects of gibberellin on the growth and flowering of intact and decotylized dwarf peas. *Nature*, 1965, **206**: 1065-6, bibl. 8.

Intact and decotylized seedlings of the dwarf late variety Dwarf Telephone and the dwarf early variety Massey were treated with 0·01 μg. gibberellin A$_3$ applied to the shoot apices one day after cotyledon excision and at 2-day intervals thereafter for a total of 4 treatments. Cotyledon excision alone reduced the number of nodes preceding the first flower by an average of 2·5 in Dwarf Telephone, thus promoting early flowering; similar treatment to Massey peas had no significant effect on the number of nodes preceding the first flower, possibly owing to the low light intensities (500–1,000 ft.-candles) used in these experiments. In Dwarf Telephone the effect of gibberellin alone was to increase the number of nodes preceding the first flower. Thus, the effect of gibberellin on the decotylized plants was partially to reverse the effect of cotyledon excision. Gibberellin caused a significant inhibition of flowering in decotylized Massey peas but had only a slight effect on the intact plants, possibly owing to the low dosage used. Gibberellin caused a 35% increase in shoot height to the first flower in intact Dwarf Telephone plants and a 46% increase in intact Massey plants. Shoot growth in gibberellin-treated, decotylized Dwarf Telephone peas was not increased over that of the untreated, decotylized controls, whereas there was an increase of 17% in Massey plants over the controls. [See also *H.A.*, 35: 3488.]—Ore. St. Univ., Corvallis.

7857. Gamburg, K. Z., Mal'ceva, V. N., and Kobyl'skij, G. I.
Effect of gibberellin on the content of nucleic acids in the internodes of pea seedlings. [Russian, with English summary ¼ p.] *Fiziol. Rast.*, 1965, **12**: 146-51, bibl. 11.

Seven- or eight-day-old seedlings of a dwarf pea variety were treated with gibberellic acid. Five days later, the amounts of DNA and RNA and the number of cells in the internodes were determined. Treatment with GA increased the number of cells and the total amounts of nucleic acids in the internodes but only increased the amount of nucleic acids per cell in the sixth internode, which was still developing at the time of analysis. The internodes of etiolated seedlings contained more cells and nucleic acids than those of green ones, and the values were little affected by treatment with GA. The nucleic acid content per internode or per cell was higher in a tall variety than in the dwarf variety. [See also *H.A.*, 35: 1071.]

7858. Reed, D. J., Moore, T. C., and Anderson, J. D.
Plant growth retardant B-995: a possible mode of action. *Science*, 1965, **148**: 1469-71, bibl. 10.

Inhibition of shoot elongation in dwarf and tall peas by the 1,1-dimethylhydrazide of succinic acid (B-995) was correlated with the inhibition of the oxidation of tryptamine-2-C^{14} to indoleacetaldehyde-2-C^{14} in homogenates prepared from epicotyls of young plants treated with B-995. The growth-retarding action of B-995 is attributed to the formation of 1,1-dimethylhydrazine *in* *vivo*. This hydrazine strongly inhibited tryptamine oxidation by pea epicotyl homogenates. [Authors' abstract.]—Ore. St. Univ., Corvallis.

7859. Barker, J.
Studies in the respiratory and carbohydrate metabolism of plant tissues. XIX. The mechanism of oxygen poisoning of respiration in pea seeds. *New Phytol.*, 1965, **64**: 210-23, bibl. 34.

Subjecting peas to high pressures of O_2 produced a progressive decrease in CO_2 output with accumulation of citrate, pyruvate, alcohol and acetate. The present results show that the progressive decrease in CO_2 output in high O_2 was also, in general, accompanied by large and continuing decreases in adenosine triphosphate and in the glycolytic intermediates, dihydroxyacetone phosphate, 3-phosphoglycerate and phosphoenolpyruvate. Fructose diphosphate also decreased more rapidly initially in O_2 than in air in 3 of the 4 experiments. O_2 poisoning thus appears to "block", partially or completely, certain respiratory pathways, the most important "block" in plant tissues probably being that at aconitase. The "blocks" are visualized as decreasing both the CO_2 output and the rate of formation of adenosine triphosphate. Thus the decreased CO_2 output in O_2 was associated with a decrease in the content of adenosine triphosphate. The decrease in the content of the latter may in turn reduce the rates of hexokinase and phosphofructokinase phosphorylation and so cause the observed decreases in contents of fructose diphosphate, and, at late stages, of glucose-6-phosphate. The decrease in fructose diphosphate appeared to reduce the rate of glycolysis, as shown by the decrease in the contents of glycolytic intermediates. [From author's summary.]—Bot. Sch., Univ. Cambridge.

7860. Moore, T. C.
Ascorbic acid and respiration in seedlings of four varieties of *Pisum sativum* L. *Phyton, Argentina*, 1965, **22**: 87-91, bibl. 23.

The concentrations of ascorbic acid (AA) and dehydroascorbic acid (DHA) were determined in seedlings of 4 pea varieties over a 96-hour period. Ascorbic acid was present almost entirely in the reduced form. The concentrations of ascorbic acid in the etiolated seedlings were approximately twice as high in the early-flowering peas as in the late-flowering peas on a weight basis. No correlation was found between either the levels of total AA or the ratios of AA to DHA in the young seedlings and the subsequent growth rates of the plants under natural environmental conditions. The different rates of endogenous respiration in homogenates prepared from seedlings of the 4 varieties were found not to be correlated with the relative amounts of ascorbic acid the seedlings contained.—Ore. St. Univ., Corvallis.

7861. Larson, L. A., and Beevers, H.
Amino acid metabolism in young pea seedlings. *Plant Physiol.*, 1965, **40**: 424-32, bibl. 23.

See also *H.A.*, 35: 1075.

7862. Helgeson, J. P.
Preparations from peas with high kinetin-like activity. *Diss. Abstr.*, 1964, **25**: 3221-2, being *Order No.* 64-12,728 of 131 pp.
Rogozinska, J. H., and others.
Partial purification of a cell-division factor from peas. *Plant Physiol.*, 1965, **40**: 469-76, bibl. 34, illus.

Water and acid extracts of frozen peas, water extracts of fresh peas and the water used to blanch peas at a commercial canning plant all contained factors capable of promoting the growth of tobacco callus tissue cultured *in vitro* on a medium containing all factors necessary for growth except kinetin or other kinins. The isolation and properties of the active material(s) are described.—Univ. Wis.

7863. Manueljan, H., Kovačev, A., and Mihov, A.
Determining relationships between certain morphological, chemical and technical properties of garden peas. [Bulgarian, with English and Russian summaries ½ p. each.] *Grad. lozar. Nauka*, 1965, **2**: 165-76, bibl. 13.

The quantitative change in dry matter content was found to be a more accurate guide to commercial maturity than the starch/sugar ratio in the varieties Maritsa 68, Plovdivska Perla, Brilliant, Jewel and Delicatesse. There was also a relationship between maturity, yield and size of peas. The value of the variety could therefore be assessed on the basis of these 3 factors at maturity, taking 20% dry matter as the standard.—"Marica" Veg. Crop Inst., Plovdiv.

7864. Drăgan, G., and others.
Contribuţii la studiul tehnologiei de recoltarea mazărei. **(Contributions to the study of harvesting techniques for green peas).** [French and Russian summaries ½ p. each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 97-107, bibl. 4.

The results are given of trials with the MRM-2.2 machine for harvesting peas. Recommendations are made for certain improvements in design and operation.

7865. Cymer, T.
Badania nad składem chemicznym i wartością użytkową okryw grochu zielonego. **(Investigations on the chemical composition and utilization of green pea hulls.)** [English and Russian summaries ½ p. each.] *Roczn. Nauk rol., Ser. A*, 1964, **89**: 657-79, bibl. 38.

Analyses of 7 wrinkled pea varieties have shown that empty pea pods are a richer source of nutritionally important chemicals than the majority of vegetables, although not as good as the pea seeds. Tasting panels have judged the products made from hulls to be edible and of good flavour.

Legumes—peas: diseases and pests.

7866. Ford, R. E., and Baggett, J. R.
Relative severity of legume viruses in peas measured by plant growth reduction. *Plant Dis. Reptr*, 1965, **49**: 627-9, bibl. 4, illus.

Five legume viruses were rated for relative severity on the basis of plant growth reduction of 14 pea varieties or lines of divergent genotypes. The order of growth reduction from least to most severe caused by the viruses, regardless of genotype, are bean yellow mosaic virus, pea enation mosaic virus, alfalfa mosaic virus, pea streak virus, and clover yellow mosaic virus. [Authors' abstract.]—Ore. St. Univ., Corvallis.

7867. Cousin, R.
Étude de la sensibilité des variétés de pois au virus de la mosaique commune du pois. Étude génétique de la résistance. **(A study of the sensitivity of pea varieties to common mosaic virus. A genetical study of resistance.)** [English and German summaries ½ p. each.] *Ann. Amél. Plantes*, 1965, **15**: 23-36, bibl. 12, illus.

Of 405 varieties inoculated, 118 were found to be resistant. The results agree with those of an earlier study of pea resistance to bean virus 2. The genetic study was carried out on the F_2 and F_3 generations of various crosses between the resistant varieties Relance and Juwel and the susceptible varieties Mignon and Diamant. Resistance was found to be monofactorially recessive.—Cent. nat. Rech. agron., Versailles.

7868. Kvíčala, B. A.
Additional insect vectors of pea mosaic virus. [German summary 4 lines.] *Phytopath. Z.*, 1965, **53**: 94-7, bibl. 10.

In this experiment 8 species of aphid transmitted the disease from broad bean to pea, including the red currant aphid (*Cryptomyzus ribis*) and the leaf curling plum aphid (*Brachycaudus helichrysi*) which do not usually colonize leguminous plants.—Inst. Virology, Czech. Acad. Sci., Bratislava.

7869. Bath, J. E.
Transmission of pea enation mosaic virus by green peach, potato and pea aphids. *Diss. Abstr.*, 1964, **25**: 3199, being *Order No.* 64-13,859 of 130 pp.

A study on the relative efficiency of adults and nymphs of 4 strains of *Acyrthosiphon pisum*, 3 strains of *Macrosiphum euphorbiae* and 2 strains of *Myzus persicae* in transmitting PEMV.

7870. Maduewesi, J. N. C.
Biological and biochemical studies with Wisconsin pea streak virus. *Diss. Abstr.*, 1964, **25**: 3200-1, being *Order No.* 64-13,902 of 120 pp.
Multiplication and movement of Wisconsin pea streak virus in pea. Abstr. in *Phytopathology*, 1964, **54**: 899.

Infectivity assays on *Chenopodium amaranticolor* indicated that the virus multiplied more rapidly in pea plants grown in sand culture supplied with higher concentrations of N (210-1,050 p.p.m.) and P (31–237 p.p.m.) than in plants given lower concentrations of these elements. Potassium concentrations ranging from 8 to 1,408 p.p.m. and light intensities of 600–1,600 ft.-candles had no appreciable effect on multiplication. Actidione at 10 and 20 p.p.m. completely inhibited virus multiplication in inoculated pea leaf discs floated for 5 days on the antibiotic solution. Streptomycin sulphate at 50, 100 and 200 p.p.m. also reduced virus multiplication, the rate of reduction increasing with the concentration. Both antibiotics were phytotoxic at all concentrations tested. Movement of the virus out of inoculated leaflets occurred within 42-53 hours and subsequently systemic infection occurred rapidly, being evident as little as 49 hours after inoculation. Virus movement was influenced by the N concentration of the nutrient medium, being most rapid in plants given 420 p.p.m. N. Light intensity, temperatures between 20° and 28° C., and P and K concentrations did not markedly influence the speed of movement.—Univ. Wis.

7871. Janýška, A.
Zkoušení rezistence hrachu proti antraknóze. **(Testing the resistance of peas to anthracnose.)** [English, Russian and German summaries ¼ p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 163-9, bibl. 19, illus.

No direct relationship was shown between the degree of field resistance of the 11 pea varieties tested and the intensity at which pycnidia of *Ascochyta pisi* formed on decoctions made from the testa and cotyledons of the same varieties. A positive correlation was found, however, between the degree of seed infection and both the varietal resistance and the climatic conditions of the areas where the seeds were produced. [For earlier work see *H.A.*, 34: 2848.]

7872. Wallen, V. R.
Field evaluation and the importance of the *Ascochyta* complex on peas. *Canad. J. Plant Sci.*, 1965, **45**: 27-33, bibl. 5.

Mycosphaerella pinodes and *Ascochyta pinodella* caused serious yield losses in the field. Although a higher percentage of seeds became infected with *Ascochyta pisi* than with either of the first 2 fungi, yield losses were considerably less. Only races III and IV of *A. pisi* caused significant losses in yield. Cycloheximide (100 p.p.m.) applied as a spray in the field significantly reduced seed infection by *A. pisi*, but also reduced seed germination. Phygon 50W and griseofulvin 50W reduced seed infection considerably, but had no effect on germination. Preliminary results suggested that certain chemicals gave a selective control of the races of *A. pisi*, but this could not be further demonstrated because of secondary infection in the field. [From author's abstract.]—Canada Dep. Agric., Ottawa.

7873. Peresypkin, V., and others.
The protection of peas from *Ascochyta* spp. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(3): 20-1, illus.

Good control of *Ascochyta* spp. and increased yields were obtained by treating pea seeds, before planting, with ammonium molybdate in solution or powder form. Seed treatments with ortho- or para-nitrophenol, the sulphates of Zn, Mn and Cu, or boric acid also reduced the number of plants damaged by *Ascochyta* spp. and increased yields compared with untreated controls.

7874. Boerema, G. H., Dorenbosch, M. M. J., and Leffring, L.
A comparative study of the black stem fungi on lucerne and red clover and the footrot fungus on pea. [Dutch summary 1 p.] *Neth. J. Plant Path.*, 1965, **71**: 79-89, bibl. 26, illus.

It appeared that the fungus causing black stem disease of red clover was identical to *Ascochyta pinodella* (= *Phoma medicaginis* var. *pinodella*) which causes foot-rot and pod spotting of peas. Inoculation results proved that *P. medicaginis* (causing black stem of lucerne) could also attack peas.—PlZiekt. Dienst, Wageningen.

7875. Papojan, F.
Concerning the control of pea diseases. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(4): 51.

The effects were studied of cultural practices on the incidence of *Ascochyta* spp. and powdery mildew [*Erisyphe polygoni*]. No relationship was found between dates of sowing and *Ascochyta* infection, but the incidence of powdery mildew increased with later sowing. Both diseases were more prevalent with band- than with row- or square-hole-sowing and both increased with higher sowing rates. Nitrogen applications encouraged, and P and K applications retarded, the development of the diseases. Applications of 50% TMTD at 400 g./centner of seeds gave the maximum increases in seed germination, seedling growth and yields and also gave complete control.

7876. Cousin, R.
Étude de la résistance à l'oïdium chez le pois. **(A study of resistance to powdery mildew in peas.)** [English and German summaries ⅓ p. each.] *Ann. Amél. Plantes*, 1965, **15**: 93-7, bibl. 3.

The reactions of about 400 varieties and 50 wild types to *Erysiphe polygoni* were studied. Slight susceptibility was observed in Anik, Duc d'Albany à Feuillage blond, Feltham First, Gullivert, Ridé vert de Knight and Roi des Serpettes, and very slight susceptibility was seen in Stratagem Resistant. Certain lines originating from Mexico and Peru were practically immune. The resistances of Stratagem Resistant and Mexique were found to be monofactorially recessive, and their F_1 hybrid was also resistant.—Cent. nat. Rech. agron., Versailles.

7877. TEMP, M., AND HAGEDORN, D. J.
Some effects of cropping on disease indices of *Aphanomyces euteiches*. From abstr. in *Phytopathology*, 1964, **54**: 910.

Soil samples, collected from 128 fields previously assayed (1955-57) for pea *Aphanomyces* root rot, were retested by a standard greenhouse test to determine changes in their disease potential. Cropping histories were also obtained for possible correlations with the various disease levels. Highly infested fields, especially on heavy soils, maintained high disease levels even without pea crops for periods of up to 8 years. Crop sequences which included 2 or 3 years of peas in periods of 6 to 8 years retained or had increased indices. Fields planted in peas and followed principally for 4–5 years with alfalfa and clovers generally maintained disease levels. Cereal crops with no peas for 6 years reduced disease incidence. [See also *H.A.*, 32: 6627.]—Univ. Wis., Madison.

7878. BAULING, J. A., AND LINN, M. B.
Compatibility of certain soil fungicides with the nodule bacterium *Rhizobium leguminosarum* garden pea strain. From abstr. in *Phytopathology*, 1964, **54**: 887-8.

In soil tests CP-30249, DAC-649, captan and nabam, at 25 p.p.m., interfered to some degree with the nodulation of peas. At 100 p.p.m. PCNB affected nodule formation less than the other fungicides tested.—Univ. Ill., Urbana.

7879. HOWELL, R. K., AND KRUSBERG, L. R.
Effect of *Ditylenchus dipsaci* on certain nitrogen compounds in alfalfa and pea. From abstr. in *Phytopathology*, 1965, **55**: 504-5.

The effect of *Ditylenchus dipsaci* infection on amounts of total N and free and bound amino acids in pea seedling shoots was determined quantitatively in non-infected and infected plant tissues at 7, 14, 21 and 28 days after nematode inoculation. Parasitism had little effect on percentage dry weight of plant tissues. Infection caused an average increase of total N by 45%, free amino acids by 33%, and bound amino acids by 52% in the tissues. About twice the amount of amino acids occurred in bound form as were found free in the various tissue samples. Infected tissue contained increased arginine, serine and tryptophan, whereas aspartic and glutamic acids were reduced. Infection caused increases in bound arginine, glycine, lysine, phenylalanine and proline.—Univ. Md, College Park.

7880. AVIDOV, Z., APPLEBAUM, S. W., AND BERLINGER, M. J.
Physiological aspects of host specificity in the Bruchidae: II—Ovipositional preference and behaviour of *Callosobruchus chinensis* L. [French summary ½ p.] *Ent. exp. appl.*, 1965, **8**: 96-106, bibl. 14.

Ovipositing *Callosobruchus chinensis* females showed preference for seeds of pea, bean (*Phaseolus*) and 2 other legumes out of a total of 8 species tested. Only pea seeds were able to sustain larval development.—Hebrew Univ., Rehovot.

7881. MOLDOVAN, M., LARIONENKO, M., AND PARUTA, T.
Treatment of pea seeds with BHC dust has little effect. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(4): 15-16.

Trials are reported in which pea seeds showing various amounts of weevil damage were treated for periods of 16–60 days with a 12% BHC dust. After 60 days' treatment only 70% weevil control was obtained. Complete control was obtained by fumigating the seeds with dichloroethane in polythene tents for 3–4 days at 400 g./cu. m. of tent space.

7882. ŠEVČENKO, A.
Metafos for the control of pea weevil. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(3): 23-4.

Treating pea seedlings with 2 or 3 applications of 2·5% Metafos (parathion+methyl parathion) dust at 15 and 20 kg./ha. at 7–8-day intervals completely controlled weevil attacks. Good results were also obtained with 2 applications of Metafos plus 5·5% DDT, but at a greater cost.

7883. ISAEVA, A., AND PIKA, N.
The resistance of hybrid forms of pea. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(4): 29-30.

In the trials here reported the resistance of the seed progeny of intervarietal and intravarietal vegetative hybrids to pea weevil and pea moth was similar to that of the controls, but was increased in the progeny of peas grafted on broad beans or lupins. Susceptibility to attack increased with later dates of sowing.

7884. BINGEFORS, S., JOHANSSON, N., AND WIKLUND, K.
Losses caused by pea moth in variety trials at the Swedish Seed Association. *Medd. St. Växtskyddsanst., Stockh.*, 1964, **12**: 413-32, bibl. 19.

Great variations in damage were observed in studies over many years at 7 localities; such variations were thought to be related to weather conditions. Significant differences between varieties were noted, but the average reduction in damage which was obtained by using the most suitable varieties was less than 10% of the total seeds attacked. Fodder peas were attacked less than cooking peas. Varieties with luxuriant growth were attacked more than those with less vegetative development. In one locality early varieties were less susceptible, and in 3 other localities late varieties were safer from attack.

Lettuce and other salad crops.

(*See also* 7640, 7659, 7660.)

7885. HUYSKES, J. A., AND RODENBURG, C. M.
De techniek van de veredeling van glassla. (**The Technique of Breeding Glasshouse Lettuce.**) [English summary 1 p.] Instituut voor de Veredeling van Tuinbouwgewassen, Wageningen, and W.E.J. Tjeenk Willink, Zwolle, 1965, 8×5½ in., pp. 86, bibl. 49, illus., f7.50.

In this compact and clearly illustrated handbook the main aspects of lettuce breeding are discussed under 6 headings, viz. characters for which selection is made and the patterns of their inheritance; methods of hybridization; the identification of true hybrids by means of easily recognizable characters such as seed colour; the principles of selection for desirable characteristics; the production of seed throughout the year and the multiplication of seed-stocks by vegetative propagation; and seed storage. The information has been compiled mainly from the experiences of the authors and other workers in Holland. J.E.K.C.

7886. Moravec, J., and Kvasnička, S.
Posouzení odrůd světového sortimentu hlávkového polního salátu (*Lactuca sativa*, var. *capitata* L.). **(An evaluation of field head lettuce varieties grown throughout the world.)** [Russian and German summaries ½ p. each.] *Rostlinná Výroba*, 1965, **11**: 53-60, bibl. 7.

The market value was assessed of 61 lettuce varieties planted out in mid-May. Of the early varieties Brilliant was the best, of the medium earlies Mělnický Máj, May King and the new selection R II, and of the late varieties Dětenická Atrakce. Variance analyses showed the growing season to have a major effect on market weight and the proportion of top grade heads, although varietal influence, with the exception of the late varieties, was also significant. In all market grades the average weight was lowered by reduced rainfall.

7887. Deboosere, G.
Rassenvergelijking bij sla. **(Lettuce variety trials.)** *Tuinbouwberichten*, 1965, **29**: 206-7.

Results with 15 spring varieties are reported. [See *H.A.*, 34: 6826 for winter variety trial.]

7888. Rodenburg, C. M.
De rassenkeuze voor de zeer vroege herfstslateelt onder glas. **(The choice of varieties for very early autumn lettuce cropping under glass.)** *Groent. en Fruit*, 1965, **20**: 2268-9, illus.

For cropping in September the variety Profos is recommended, and Resistent, normally a summer lettuce, has also given good results at Wageningen. However, Profos is not recommended for late autumn cropping as then it matures too slowly.

7889. van Winden, W. P.
Zomersla onder glas. **(Summer lettuce under glass.)** *Groent. en Fruit*, 1965, **20**: 2187.

Several glasshouse and outdoor varieties were compared for a July catch-crop under glass. Short-day treatment was applied to a proportion of the plants up to the time of planting out. With the exception of Profos, all the glasshouse lettuces bolted before the heads were ready to cut, although the plants given short-day treatment bolted slightly later than the untreated plants. Profos and the outdoor varieties Resistent, Feltham Wonder and Attractie gave satisfactory crops without premature bolting. Profos formed very soft heads which were liable to *Botrytis* infection; Resistent (the best variety) gave firm disease-resistant heads, and the plants benefited from short-day treatment which reduced the tendency to bolt. Feltham Wonder also formed firm heads and few bolted; Attractie was prone to *Botrytis* damage.—Proefstat. Groent. Fruit. Glas, Naaldwijk.

7890. Scheibe, J., and Lang, A.
Lettuce seed germination: evidence for a reversible light-induced increase in growth potential and for phytochrome mediation of the low temperature effect. *Plant Physiol.*, 1965, **40**: 485-92, bibl. 22.

With the aid of a new technique employing the radicle halves of seeds of the light-sensitive variety Grand Rapids, irradiation with red light and treatment with GA_3 were shown to result in an increase in the growth potential of the embryonic axis of lettuce seeds. The results of red irradiation showed that phytochrome (in the far-red absorbing form) increased the growth potential of the embryo, enabling it to overcome the mechanical restraint against expansion imposed by the endosperm. Responses both to irradiation and GA_3 appeared to be confined to the radicle; kinetin did not elicit a similar response. The light response in the half-seed was not dependent on the presence of the endosperm. The promotive effect of low temperature (11° C.) on germination was lost if cold incubation was preceded by a short exposure to high temperature (37°). Far-red light reversed the effect of high temperature, restoring the capacity for promotion by low temperature. [From authors' summary.]—Calif. Inst. Tech., Pasadena.

7891. Khan, A. A., and Tolbert, N. E.
Reversal of inhibitors of seed germination by red light plus kinetin. *Physiol. Plant.*, 1965, **18**: 41-3, bibl. 4.

Germination of Grand Rapids lettuce seed was inhibited by coumarin, xanthatin and a natural inhibitor from immature wheat hulls. Inhibition of germination by these substances was reversed by a combination of red light plus kinetin but not by either red light or kinetin alone. [Authors' summary.]—Mich. St. Univ., E. Lansing.

7892. Niklewski, Z.
Kiełkowanie nasion sałaty w obecności ukorzenionych roślin gwiazdnicy, mleczu i jaskółczego ziela—doświadczenia alelopatyczne. **(The germination of lettuce seeds in the presence of rooted plants of common chickweed, dandelion and greater celandine—allelopathic investigations.)** *Roczn. Nauk rol., Ser. A*, 1964, **89**: 681-4, bibl. 6.

Germination in ascending order was: control, *Stellaria media*, *Taraxacum officinale* and *Chelidonium majus*. The presence of chopped celandine leaves inhibited germination. [See also *H.A.*, 34: 6829.]

7893. Janssen, G.
Sla blijkt hoogst dankbaar voor wat grotere perspot. **(Lettuce seems to respond well to a larger soil block.)** *Groent. en Fruit*, 1965, **21**: 145, illus.

Three sizes of soil block were compared for glasshouse lettuce seedlings, viz. 4, 5 and 6 c.c. Spring, autumn and winter crops were grown using a soil-block mixture of equal parts of peat and soil. Seedlings raised in 6-c.c. pots produced the heaviest crop at all times of the year. Compared with 4-c.c. pots the 2 larger sizes showed the following advantages: steady unchecked growth, heavier yields, fewer losses from damping-off and the house occupied by the crop for a shorter time.—Proeft. Venlo.

7894. Van Bastelaere, H.
Het bemesten van sla. **(Manures for lettuces.)** *Meded. BedrVoorlicht. Oost-Vlanderen* **32**, 1965, pp. 2, bibl. 1.

A fuller account of work reported in *H.A.*, 35: 5760.

7895. Morani, V., and Tombesi, L.
Soilless culture of lettuce. [Italian?] *Ann. Staz. chim.-agr., Roma, Ser. III*, 1963, No. 209, pp. 11, from abstr. in *J. Sci. Food Agric.*, 1965, **16**: i-295-6.

The effects were studied of different levels of N, P and K on the yield, head development and N, P, K, Ca, Mg and cellulose contents of Trocadero and Roman lettuces, and on the chlorophyll and carotene contents of the Trocadero lettuce only. The greatest yield increase was obtained by increasing the P_2O_5 content of the medium from 20 to 80 p.p.m. Increasing the K content reduced, and raising the N content increased, the percentage of closed heads.

7896. HERNANDO, V., AND SÁNCHEZ CONDE, M. P.
Estudio de deficiencias minerales en el cultivo de lechuga romana. **(A study of mineral deficiencies in cos lettuce.)** [English summary 12 lines.] *An. Edafol. Agrobiol.*, 1964, **23**: 769-76, bibl. 6.

Plant height, fresh weight and mineral composition (N, P, K, Ca, Mg, Na) were recorded for winter and summer sand cultures of cos lettuce, each lacking one of the elements N, P, K, Ca, Mg and Fe. The controls received all these elements. Lack of N produced the earliest and most severe deficiency symptoms and had the greatest effect on plant composition; symptoms and changes caused by Ca deficiency were the least evident and last to develop. Drought resistance was reduced by lack of either Ca or K. The leaves were richer in K, Ca and Mg and poorer in P and Na than the stems, except in the K-deficient plants, where the relationship was reversed. In these the K/Ca ratio remained constant, but in all other cases it was higher in summer than in winter. In summer the total cation content was reduced only by K deficiency, but in winter by every deficiency.—Inst. Edafol. Biol. veg., Madrid.

7897. STEINECK, H.
Nährstoffgaben über die Spaltöffnungen. **(Nutrient application through the stomata.)** *Rhein. Mschr. Gemüse-, Obst- u. Gartenb.*, 1964, **52**: 401-2, from abstr. in *Informationsdienst Weihenstephan*, 1965, No. 6, pp. 85-6.

In greenhouse experiments lettuce and tomatoes (Hellfrucht) were treated with 0·1% CO_2. Lettuce yields were increased and returns rose by 0·10 DM./head. The tomato harvest date was advanced.

7898. RAI, V. K., AND LALORAYA, M. M.
Correlative studies on plant growth and metabolism. I. Changes in protein and soluble nitrogen accompanying gibberellin-induced growth in lettuce seedlings. *Plant Physiol.*, 1965, **40**: 437-41, bibl. 11.

It was shown that GA treatment results in enhanced mobilization of reserve N from the cotyledons to the growing axes. More of the N is, however, retained in the hypocotyl than is translocated to the roots. The internal distribution of the translocatable N is thus altered by gibberellin treatment. The growth effects of GA show no direct relationship to either the loss of protein from the cotyledons or the extent of enhanced protein synthesis in the hypocotyl. The change in the soluble-N content in different parts, however, shows close correlations with growth effects. The gibberellin-treated seedlings exhibit a lower protein/soluble-N ratio than the water-grown seedlings. The increase in fresh weight is in fact accompanied by the loss of protein. This is against the view that increased protein synthesis and water uptake go hand in hand during growth. [From authors' summary.]—Univ. Allahabad.

7899. RAI, V. K., AND LALORAYA, M. M.
"Root factor" in gibberellin induced growth of hypocotyl in lettuce seedlings. *Naturwissenschaften*, 1965, **52**: 397, bibl. 9.

Young lettuce seedlings with a hypocotyl length of 1·5–2·0 mm. were subjected to treatments involving the removal of (a) the cotyledons plus stem tip, (b) ⅔ of the cotyledons, (c) roots plus ⅔ of the cotyledons, (d) roots only, or (e) roots plus cotyledons plus stem tip. The remaining parts were supplied with water or with GA solution (plus sucrose except with removal of roots only). With GA treatment the length of the hypocotyl after 4 days was 14·1 mm. in the intact control and 2·0, 8·5, 4·5, 4·3 and 2·0 with the different treatments. Without GA the figures were 3·0 mm. in the control and 1·4, 2·8, 2·2, 2·1 and 1·9 mm. with the different treatments. It was concluded that the roots contribute to the gibberellin-induced growth of the hypocotyl, and the nature of this root factor is being studied. [For related work see *H.A.*, 33: 2046.]—Univ. Allahabad.

7900. WATTS, L. E., CHANNON, A. G., AND WEBB, M. J. W.
Breeding for downy mildew resistance. *Grower*, 1965, **63**: 1114-15, illus.

The lettuce breeding programme at the National Vegetable Research Station at Wellesbourne is summarized, and the results are given of 4 years' trials of lettuces which included 2 N.V.R.S. varieties bred for resistance to infection by *Bremia lactucae*. [For a fuller report see *H.A.*, 34: 6658.]

7901. LUŽNÝ, J.
Příspěvek k otázce šlechtění na resistenci proti plísni salátové (*Bremia lactucae*, Reg.). **(A contribution to the problem of breeding for resistance to downy mildew of lettuce, *Bremia lactucae*.)** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 67-82, bibl. 8, illus.

In artificial infection trials with lettuce, in spite of considerable variability, some varietal groups showed a degree of resistance to *B. lactucae*. Certain correlations were found between the contents of total and reducing sugars and the percentage of affected leaves.

7902. MATTA, A.
Una malattia della lattuga prodotta da una nuova specie di *Pythium*. **(A disease of lettuces produced by a new species of *Pythium*.)** [French and English summaries ½ p. each.] *Phytopath. medit.*, 1965, **4**: 48-53, bibl. 6, illus.

Symptoms, including stunting and wilting of young lettuce plants, were found to be caused by blocking of the xylem by a member of the Pythiaceae more pathogenic than *Pythium debaryanum* or *P. ultimum* and designated as *P. tracheiphilum* n. sp.—Univ. Studi, Torino.

7903. BAKER, R. T., AND EADE, R. P.
Commercial trial shows promise that new fungicides can control lettuce ring spot. *N.Z. comm. Gr*, 1965, **20**(11): 15, bibl. 1.

Difolatan, Duter, captan and zineb were compared for the control of ring spot [*Marssonina panattoniana*]. All except zineb significantly reduced infection; plots sprayed with Difolatan yielded the highest number of marketable heads.

7904. Kasmire, R. F.

Sources of information related to the handling, transportation and marketing of western lettuce. *Perishables Handling Suppl. Calif. agric. Ext. Serv.* **1**, 1964, pp. 11.

A bibliography of 111 references.

7905. Stewart, J. K., and Ceponis, M. J.

Transit temperatures of heavy loads of California lettuce shipped in several types of rail equipment. *Mktg Res. Rep. U.S. Dep. Agric.* **683**, 1964, pp. 10, bibl. 2.

The optimum temperature of 32° F. was exceeded by 5–7 degrees in all types of refrigerated car. [See also *H.A.*, 29: 1552b.]

7906. Kaufmann, F.

Zum Einfluss des Aussaattermines auf die Ertragsleistung bei Chicorée (*Cichorium intybus* L. var. *foliosum* Hegi). **(The influence of sowing dates on the yield performance of chicory.)** [Russian and English summaries ⅓ p. each.] *Arch. Gartenb.*, 1965, **13**: 15-23, bibl. 14.

Chicory was sown in mid-May, late May, mid-June and late June, and forcing experiments were undertaken with the roots immediately after harvest. Root yields and forcing results were little different for the mid-May to mid-June sowings, but were reduced by about 50% in the late June sowing.—Inst. Gemüseb. Grossbeeren.

7907. Baptist, P.

Investigations on chicory soil improvement. [Dutch.] *Jversl. Roermond 1963*, pp. 95-8, from abstr. in *Informationsdienst Weihenstephan*, 1965, No. 5, p. 68.

The addition of humus improved (by up to 50%) the water-holding capacity of soils in chicory forcing beds. Compost or compost+peat was most suitable for this, the material being applied in a 20-cm. layer and mixed with the soil to a depth of 30–60 cm.

7908. Wellensiek, S. J.

Root vernalization of *Cichorium intybus* L. Reprint from *Proc. kon. ned. Akad. Wetensch., Ser. C*, 1964, **67**: 307-12, bibl. 6.

Root cuttings deprived of all growing points could be vernalized, well-developed roots supplying large cuttings being selected and the period of vernalization being as long as 20 weeks. Exposing the cuttings to 20° C. during the 1 or 2 weeks prior to vernalization was detrimental.

7909. Paulet, P., and Nitsch, J. P.

La néoformation de fleurs sur cultures *in vitro* de racines de *Cichorium intybus* L.: Étude physiologique. **(Flower formation on *Cichorium intybus* roots cultured *in vitro*: a physiological study.)** [English summary 9 lines.] *Ann. Physiol. vég.*, 1964, **6**: 333-45, bibl. 14, illus.

Normal flowers were obtained on tissues taken from roots of Witloof chicory which had been stored for several months in damp sand at 0–10° C. Vernalization appeared to be essential. The addition of IAA to the culture medium inhibited floral initiation, even in quantities which did not prevent the formation of vegetative buds. Flowering was stimulated by GA at 10^{-7} and 10^{-6}M, flowers being produced directly without intermediary leaves. When coumarin and coumaric, shikimic and ferulic acids were added to the culture medium, coumarin at 10^{-6}M stimulated floral initiation as did p-coumaric acid. A long day-length was as essential to flowering in the tissues as it is to the whole plant, particularly during a critical period in the second and third weeks.—Cent. nat. Rech. sci., Gif-sur-Yvette.

7910. Nováková, J., and Kutáček, M.

Váhové stanovení intenzity fotosyntézy terčiku listového pletiva u dvou odrůd cukrovky a čekanky. **(Photosynthesis determination by weight in leaf discs of two sugar beet and chicory varieties.)** [Russian and German summaries ½ p. each.] *Rostlinná Výroba*, 1965, **11**: 171-80, bibl. 10.

No significant differences were found in the photosynthetic capacity of 2 chicory varieties as measured by the dry weight increase of leaf discs [see *H.A.*, 31: 3792]. Saturating the leaf tissues with water in darkness for more than 17 hours before the experiment reduced the increments. The increments were linear for 8 to 12 hours and due mainly to an increase in the sugars, especially reducing sugars. The level of α-amino N in the leaf discs decreased, whereas the total N content remained unchanged.

Mushrooms.

(*See also* 8036, 8115.)

7911. Burden, O. J.

Cultivating mushrooms. *Qd agric. J.*, 1965, **91**: 217-37, illus.

Advice on growing conditions, compost making, bed preparation, spawning, cropping, harvesting, marketing and hygiene.

7912. Philipp, A.

Ein Beitrag zur Züchtung des Kulturchampignons. **(A contribution to the breeding of cultivated mushrooms.)** [Russian and English summaries ⅓ p. each.] *Arch. Gartenb.*, 1965, **13**: 77-92, bibl. 20, illus.

Mushroom varieties were selected from 433 individual cultures which gave better yields than commercial varieties. Other characteristics such as earliness, higher weight, colour and shape were considered of secondary importance. Characteristics of the varieties selected are described.—V.E.G. Champignonzucht Dieskau.

7913. Kindt, V.

Der gegenwärtige Stand in der Entwicklung von synthetischen Substraten. **(The present position in the development of synthetic substrates.)** *Dtsche Gärtner-Post*, 1965, **17**(12), Suppl. *Champignonanbau*, No. 1, pp. 5-9, bibl. 7, illus.

Variations in the components of the standard mushroom substrate (cereal straw, poultry manure or deep litter and minerals) are discussed. No yield data are included. [See also *H.A.*, 35: 3545.]—V.E.G. Champignonzucht Dieskau.

7914. Riethus, [H.].

Die Bedeutung der Höhe des Stickstoffgehaltes von Substraten für den Ertrag. **(The effect of the nitrogen content of the substrate on yield.)** *Champignon*, 1965, **5**(45): 9-12, bibl. 3.

Three tests with 5 composts from different sources were conducted. The total N in the composts ranged from 1·74 to 2·15%, and the yield of mushrooms from 4·5 to 10·5 kg./sq. m. No direct relationship was observed between N content and yield. [See also *H.A.*, 34: 4868.]

7915. MAYER, K.
Die Champignonfliegen. I. Teil. Biologie und wirtschaftliche Bedeutung. **(Mushroom flies. Part I. Biology and economic importance.)** *Champignon*, 1965, **5**(46): 9-13, bibl. 13.

Lycoria pectoralis, *Megasilea* spp., *Mycophila* spp. and *Heteropeza pygmaea*.

7916. CRASKE, J. D., AND REUTER, F. H.
The nitrogenous constituents of the dehydrated mushroom, *Boletus edulis,* and their relation to flavour. *J. Sci. Food Agric.*, 1965, **16**: 243-50, bibl. 35.

Steam distillation of dehydrated *B. edulis* gave a "flavour essence" which contained only the unpleasant off-flavour components of the sample. The true mushroom flavour was found to be non-volatile, the residue after distillation being of undiminished flavour intensity. About half of the sample was water-soluble and this extract contained all of the flavour components. These were concentrated into the basic fraction and further separated into fractions containing amino acids of progressively increasing basicity. The most basic compounds tasted most characteristically of mushrooms, but all the nitrogenous constituents contributed to the overall flavour profile. [From authors' abstract.]—Unilever Aust. Pty Ltd, Balmain, N.S.W., and Univ. N.S.W., Kensington.

Okra.

7917. PERLASCA, G.
Ortaggi meno conosciuti: okra. **(Less common vegetables: okra.)** *Inf. Ortoflorofruttic.*, 1965, **6**: 235-7, bibl. 1, illus.

Origin and distribution, uses, varieties grown in the U.S.A. and in Italy, and cultural practices.

7918. DAS, V. S. R., RAO, J. V. S., AND RAO, K. R.
Endogenous auxin and its diurnal rhythm in leaves. *Indian J. Plant Physiol.*, 1964, **7**: 25-9, bibl. 16.

IAA was identified as the naturally occurring auxin in young and mature leaves of *Hibiscus esculentus* and *Piper betle*. Six-hourly quantitative estimations of auxin in young leaves of both species revealed similar diurnal rhythms, with maxima and minima occurring at noon and 0600 hours, respectively. In mature *Piper* leaves the auxin content exhibited the same maximum and minimum but declined less sharply than that of young leaves between noon and 1800 hours.—Sri Venkateswara Univ., Tirupati, A.P.

7919. MOTSINGER, R. E.
Root-knot nematode population measurements in soil for use in a nematode advisory service. *Diss. Abstr.*, 1965, **25**: 3778, being *Order No.* 61-11,014 of 88 pp.

Field studies on nematode population distribution and changes around individual okra plants and the correlation of larval numbers before planting with the yield of individual plants, accompanied by an evaluation of the efficiency of 2 nematode extraction methods, were conducted to gain information for possible use in a nematode advisory service. The field studies were carried out in concrete bins containing a sandy loam soil inoculated with *Meloidogyne incognita*. Taking soil samples from October to December, when populations were highest, was preferable, and the variability of nematode distribution in the soil indicated that a large number of core samples should be taken to determine the root-knot infestation of an area. Samples to a depth of 9 in. included the region of heaviest infestation in all months of the test.—Auburn Univ.

Onions and related crops.

(*See also* 7017, 8231.)

7920. MINISTRY OF AGRICULTURE, LONDON.
Onions and related crops. *Bull. Minist. Agric., Lond.*, **69**, 5th Edition, 1965, pp. 30, illus., H.M.S.O., 3s. 6d.

This new edition, completely revised, replaces the fourth edition published in 1965. It contains the latest information on the cultivation of bulb, pickling and salad onions, onion drying and storage (including controlled temperature and humidity), onion sets (production, storage and growing-on), leeks, shallots, garlic and the control of diseases, pests and weeds. There is a short section on chives. [For 4th Edition see *H.A.*, 26: 642.]

7921. C—., C.
Ajuinproduktie in Polen. **(Onion production in Poland.)** *Tuinbouwberichten*, 1965, **29**: 217.

A brief article on production, exports and varieties.

7922. BERNINGER, E.
Contribution à l'étude de la stérilité-mâle de l'oignon (*Allium cepa* L.). **(Contribution to the study of male sterility in the onion.)** [English and German summaries 11 and 13 lines.] *Ann. Amél. Plantes*, 1965, **15**: 183-99, bibl. 12.

Male-sterile forms among local varieties are a prerequisite for the production of hybrid combinations most suited to the French climate. Investigations of the commonest local varieties have revealed 2 types of male sterility, one of which should be useful in the breeding programme.—Cent. nat. Rech. agron., Versailles.

7923. KABELÍK, J., LUŽNÝ, J., AND MORAVEC, J.
Antibiotické a hospodářské vlastnosti sortimentu cibule kuchyňské (*Allium cepa* L.). **(Antibiotic and economic properties of various onion varieties.)** [English, Russian and German summaries ⅓ p. each.] *Bull. výzk. Úst, zelin., Olomouc*, 1964, **8**: 115-31, bibl. 8.

Data presented from field experiments with 58 onion varieties from 13 countries include yields, quality, uniformity, growth period and soluble solids content. The antibiotic properties of the stored onions were also tested in the laboratory.

7924. OGAWA, T., AND NIUCHI, K.
Studies on seed production in onions. III. Effect of soil on plant growth and yield and quality of seeds. [Japanese, with English summary ⅓ p.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 327-34, bibl. 20, illus.

Mother bulbs were raised in large, bottomless frames containing soils of different origins and textures. The number of florets per plant was correlated with plant growth in spring expressed as total leaf length in March. The best plant growth and seed yields were obtained in certain clay soils. Stalks remaining healthy and green until harvest produced heavy seeds; those which turned yellow quickly or were diseased produced light seeds with low viability. [For part II see *H.A.*, 33: 3108.]

7925. Mital, S. P., and Srivastava, G.
Seed yield in relation to bulb size and number of seed-stalks in onion (*Allium cepa* L.). *Indian J. Hort.*, 1964, **21**: 264-9, bibl. 1.

In Pusa Red and Early Grano onions an increase in the flower stalks up to a certain number gave an increase in seed yields, but beyond this point seed yields did not increase in the same proportion and there were reductions in seed size and germination capacity, and also in bulb size in the following crop. The optimum stalk number was 3–4 in Early Grano (giving 37·1 g. seed per plant) and appeared to be between 6–8 (38·1 g. seed) and 12–15 (53·8 g.) in Red Pusa.—Indian agric. Res. Inst., New Delhi.

7926. Hämäläinen, A.
Sipulin pikkuistukkaiden viljelyn tekniikkaa. **(How to grow onion sets.)** *Puutarha*, 1965, No. 4, pp. 192-3, illus.

Advice on producing sets from seed in Finland.

7927. Jaša, B.
Studium vlivu hustoty, hloubky a doby setí na přezimování kuchyňské cibule odrůd Všetatská a Obrovská žlutá. **(A study of the effects of density, depth and time of sowing on the overwintering of the onion varieties Všetatská and Obrovksá Žlutá.)** [Russian and German summaries ½ p. each.] *Rostlinná Výroba*, 1965, **11**: 35-44, bibl. 26.

From this and earlier work [see *H.A.*, 32: 6682, 33: 5187 and 34: 2900] it is concluded that onion seedlings can overwinter satisfactorily in southern Moravia. The most suitable time for autumn sowing was 15–20 August and the most suitable spacing was 4 or 2 cm. in the row. Depth of sowing as a rule did not affect overwintering. In a year of favourable climatic conditions during the autumn, winter and early spring 79·5–85·6% of the plants survived, but during unfavourable weather only 30·0–38·5% survived.

7928. Strydom, E.
The effect of transplant size on the occurrence of bolters and split bulbs of onions (*Allium cepa*). [Afrikaans and French summaries ⅓ p. each.] *S. Afr. J. agric. Sci.*, 1965, **8**: 33-42, bibl. 9.

Three separate trials were conducted to determine the effect of different plant sizes on the occurrence of bolters and split bulbs and on the yield of the subsequent onion crop. In the first trial onion transplants from ordinary seed-beds of the cultivar Early Cape Flat were classified in 3 sizes; in the second 4 sowing rates were employed in the seed-beds; and in the third 3 rates of N application to the seed-beds were used to obtain various plant sizes. In all 3 experiments smaller transplants produced a lower precentage of bolters and split bulbs than larger plants. Within certain limits yield was not affected by transplant size. From the results it can be concluded that a plant length of about 9 in. is the most suitable size for an onion transplant. This length is obtained at a sowing rate of 5 oz. seed per 100 sq. ft. of seed-bed area on a medium fertile soil. [Author's abstract.]—Hort. Res. Inst., Pretoria.

7929. Sandhu, A. P.
Response of onion (*Allium cepa*) to different sources and levels of nitrogen. *Indian J. Hort.*, 1964, **21**: 252-6, bibl. 9.

Ammonium sulphate, ammonium chloride, ammonium nitrate and urea were equally effective when applied after a basal dressing of 12 tons FYM per ha. The application of more than 67·25 kg. artificial N per ha. (the lowest rate tested) was uneconomical. This rate gave a mean yield increase of 80% compared with the control.—Indian agric. Res. Inst., New Delhi.

7930. Stannek, G., and Holzmann, W.
New production techniques for onion crops at the LPG Ilberstedt in Bernburg. [German.] *Wiss. tech. Fortschritt f. Landw.*, 1964, **5**(2): 71-4, bibl. 8.

In onion crops on a collective farm in E. Germany the use of calcium cyanamide at 2 dt./ha. applied 3 to 5 days before sowing followed by chlorpropham (as Elbanil or Prevenol 56) at 12 l./ha. in 600 l. water on medium to heavy soils and at 9–10 l./ha. on light soil, applied 8 to 10 days after sowing, reduced the number of man-hours spent on cultivating and hand-weeding from 750–800/ha. to 150–170/ha.—*Weed Abstr.*, **14**, No. 76.

7931. Green, D. H., Hocombe, S. D., and Kalogeris, B.
Three experiments with soil-acting herbicides in onions. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 14, bibl. 3.

In this study 17 compounds, mostly carbamates and ureas, were compared in 2 pre-emergence and 1 post-emergence screening trial on volcanic loamy sand. Good control of weeds for not less than 5–6 weeks was provided in at least one pre-emergence trial by BP-3 (*a*-carbo-(2,4-dichlorophenoxyethoxy)-ethyl-*N*-phenylcarbamate) at 2 lb./acre, BP-4(*a*-carbo-(2,4-dichlorophenoxyethoxy)-ethyl-*N*-(3-chlorophenyl) carbamate) at 4 lb./acre, BP-9 (sec-butyl-*N*-(3-chlorophenyl)carbamate) at 4 lb./acre, cycluron at 1·5 lb./acre, cycluron at 1·5 lb./acre plus BiPC at 1·05 lb./acre (as Alipur), chlorpropham at 4 lb./acre, diuron at 1 lb./acre, 2,4-dichlorophenyl-4-nitrophenyl ether at 5 lb./acre and C-3470 (*N*-4-(*p*-methoxyphenoxy)-phenyl-*NN*-dimethylurea) at 2 lb./acre. However, in the one trial in which crop emergence was sufficient to enable tolerance to be assessed, only C 3470 showed appreciable selectivity. Ioxynil at 1 lb./acre, C 3470 at 3 lb./acre, BP-3 and BP-9 at 3 lb./acre and H 95-1 (buturon) at 1 lb./acre were tolerated by onions at the 5-leaf stage 3 days after transplanting. H 95-1 at 2 lb./acre slightly stunted the crop and diuron at 1 lb./acre caused severe injury. C 3470 at 1·5 lb./acre and H 95-1 at 2 lb./acre gave adequate weed control for 7 weeks and BP-3 at 1·5 lb./acre and H 95-1 at 1 lb./acre for 5–7 weeks. [For earlier work see *H.A.*, 34: 853.]—Trop. Pestic. Res. Inst., Arusha, Tanzania.—From *Weed Abstr.*, **14**, No. 77.

7932. Srb, V.
Irreversible effects of ionizing RTG-radiation on the osmotic properties of the epidermal cells of *Allium cepa* L. bulbs. [Czech and Russian summaries ½ p. each.] *Biol. Plant., Prague*, 1965, **7**: 270-84, bibl. 82.

Onion bulbs (var. Všetaty), taken from growing plants and also immediately after harvest, were exposed to RTG radiation (100, 250, 500, 1,000, 2,500 and 5,000 r.). In plasmolysis experiments the radiation-induced changes of epidermis cell permeability were irreversible. With non-electrolytic agents (1M sucrose, 1M glycerol and 1M urea) the equilibrium state (total plasmolysis) was reached more rapidly with irradiated bulbs than with non-irradiated controls. When electrolytes were used (0·5M KNO_3 and 0·5M KBr), total plasmolysis occurred less rapidly with the irradiated bulbs. These relationships were manifest during the whole ontogenesis of onion, an exposure of 100 r. being sufficient to cause the changes. [From author's abstract.]—Charles Univ., Hradec Králové.

7933. LUGOD, G. J. C.
Mutagenic effects of phytoextracts from *Pangium edule* Reinw. and *Hydnocarpus alcalae* C.DC. upon living root tip tissues of onion and rice. *Araneta J. Agric.*, 1964, **11**: 138-63, bibl. 30, illus.

High concentrations of seed and bark extracts from both plants were toxic to onion roots. Seed extracts of *P. edule* at lower concentrations caused enlargement of onion roots and mitotic aberrations. *Hydnocarpus* seed extracts caused plasmolysis but no abnormal mitosis.

7934. CLARKSON, D. T.
The effect of aluminium and some other trivalent metal cations on cell division in the root apices of *Allium cepa*. *Ann. Bot., Lond.*, 1965, **29**: 309-15, bibl. 11, illus.

Elongation of onion roots was completely inhibited after 6–8 hours' treatment with 10^{-3} and 10^{-4}M aluminium sulphate solutions. The cessation of root elongation was closely correlated with the disappearance of mitotic figures. The time taken for complete inhibition of cell division and root elongation was dependent on the ambient temperature. Abnormalities of the mitotic apparatus were not seen. Treatment of onion roots with other trivalent metals, Ga, In and La, produced similar results. [From author's abstract.]—Dep. Bot., Univ. Exeter.

7935. MÄKINEN, Y.
Effect of glucose on excised onion roots. *Ann. Acad. Sci. fenn., Ser. A, Biol.*, **88**, 1965, pp. 11, bibl. 10.

A 1% glucose solution increased mitotic frequency in the root tip meristem of excised onion roots. The frequency reverted to normal in 48 hours. The glucose treatments also led to increases in the length, thickness and cell numbers of the treated roots as compared with roots kept in distilled water. [From author's summary.]—Univ. Turku.

7936. HÄRDTL, H.
Die Anfälligkeit der Speisezwiebel gegenüber dem Gelbstreifenvirus. **(The susceptibility of onions to yellow dwarf virus.)** [English and French summaries ½ p. each.] *Gartenbauwiss.*, 1965, **30**: 57-61, bibl. 4.

Sap transmission of the virus to young plants under glass at different times of the year revealed only small differences in susceptibility. In field trials, however, symptoms appeared on 39% of young plants and 4% of older plants. Symptomless late-tested plants were placed under glass, whereupon 67·5% developed symptoms. Symptoms were produced on 20–50% of all tested plants of various varieties. There was no visible spread of the virus to adjacent controls.

7937. LORBEER, J. W., AND STONE, K. W.
Reaction of onion to *Fusarium* basal rot. *Plant Dis. Reptr*, 1965, **49**: 522-6, bibl. 14.

Fourteen varieties of onion were tested in field trials for susceptibility to basal rot caused by *Fusarium oxysporum* f. sp. *cepae*; the varieties Elba Globe and Iowa 44 were the least susceptible. Of 10 varieties tested all were equally susceptible to infection by *Pyrenochaeta terrestris*, the cause of pink root. Bulb decay caused by *Fusarium* penetration into the basal plate region in the absence of any notable insect injury in susceptible onion varieties was markedly visible before harvesting the onion bulbs. Post-harvest infection of bulbs appeared to be of minor importance. [From authors' summary.] —Cornell Univ., Ithaca, N.Y.

7938. HANCOCK, J. G., MILLAR, R. L., AND LORBEER, J. W.
Pectolytic and cellulolytic enzymes produced by *Botrytis allii, B. cinerea,* and *B. squamosa in vitro* and *in vivo*. *Phytopathology*, 1964, 54: 928-31, bibl. 10, illus.

In detached onion leaf sections and in leaves on intact onion plants.

7939. HANCOCK, J. G., MILLAR, R. L., AND LORBEER, J. W.
Role of pectolytic and cellulolytic enzymes in *Botrytis* leaf blight of onion. *Phytopathology*, 1964, **54**: 932-5, bibl. 11, illus.

A fuller account of work abstracted in *H.A.*, 33: 3116.

7940. NICHOLS, C. G., AND OTHERS.
The expression and inheritance of resistance to pink root in onion seedlings. *Phytopathology*, 1965, **55**: 752-6, bibl. 8, illus.

In a greenhouse seedling test to screen onion lines for resistance to the pink root fungus, *Pyrenochaeta terrestris*, and to assay lines segregating for resistance, the most important variables affecting the uniformity of infection and expression of resistance were: the fungus isolate, inoculum concentration, moisture content of the sand during the test, and seed quality. Control of these variables gave highly reproducible results in populations segregating for resistance. [From authors' abstract. See also *H.A.*, 34: 4917.]—Campbell Soup Co., Paris, Texas, and Univ. Wis., Madison.

7941. PANDOTRA, V. R.
Purple blotch disease of onion in Punjab. II. Studies on the life-history, viability and infectivity of the causal organism *Alternaria porri*. *Proc. Indian Acad. Sci., Sect. B*, 1965, **61**: 326-30, bibl. 3.

Alternaria porri retains its viability from one season to the next in onion leaves and seed stalks left as debris on the soil surface. Viability is lost when such debris is buried 2 in. or more deep in the soil. [For part I see *H.A.*, 3581.]—Reg. Res. Lab., Jammu.

7942. LOCKE, S. B.
An improved laboratory assay for testing effectiveness of soil chemicals in preventing white rot of onion. *Plant Dis. Reptr*, 1965, **49**: 546-9, bibl. 12.

By the procedure outlined PCNB, and 2,6-dichloro-4-nitroaniline (Botran) were proved effective in the laboratory and confirmed by subsequent field trials to prevent white rot of onion caused by *Sclerotium cepivorum*. [From author's abstract.]—Wash. St. Univ., Pullman.

7943. SOUTHEY, J. F.
The incidence and location of stem eelworms on onion seed. *Plant Path.*, 1965, **14**: 55-9, bibl. 6.

Ditylenchus dipsaci has been found in 5·7% of onion seed samples examined for export purposes during 1952-63 at infestation levels of up to 75 nematodes per g. seed. It has also been found in seed of shallots but not of leeks or chives. In a heavily infested sample of onion seed, the nematode occurred beneath the seed coat was well as attached to its outer surface, but not within the endosperm or embryo. In the seed sample studied, few of the nematodes were associated with extraneous matter, but the proportion might be higher in samples where this material included more onion flowers or their remnants. [From author's summary.]—Plant Path. Lab., Harpenden, Herts.

7944. NIEMCZYK, H. D.
The response of *Hylemya antiqua* adults to hydrolized proteins and other materials: a laboratory study. *J. econ. Ent.*, 1965, **58**: 428-8, bibl. 12.

The greatest responses were to enzymatic yeast hydrolysate and honey.

7945. SIMS, W. L., AND LITTLE, T. M.
Growing garlic in California. [*Publ.*] *Univ. Calif. agric. Ext. Serv.* **AXT-28**, revised 1964, pp. 13.

Advice is given under the following headings: the garlic plant (including descriptions of 3 varieties); propagation; culture (including fertilizers and irrigation); harvesting and marketing; and pests and diseases and their control.

7946. ERŠOV, I. I., AND ABRAHINA, JU. V.
The influence of environmental conditions on the morphological and biological characteristics of garlic. [Russian.] *Agrobiologija*, 1965, No. 1, pp. 86-93, bibl. 6, illus.

Trials are described in which garlic plants from various regions of the U.S.S.R. lost or gained the ability to produce a scape when planted in the autumn under the different geographical and climatic conditions of the Moscow region. Dates of maturity were also affected. The influence of the environmental conditions became more marked in succeeding generations.

7947. ASHTON, F. M., AND OTHERS.
CIPC for weed control in garlic. *Calif. Agric.*, 1965, **19**(6): 10-12, illus.

CIPC at 3, 12, 48 and 192 p.p.m. a.e. was mixed with light (sand) and heavy (clay) soils in pots in which garlic cloves were then planted. After 7 months the plants were harvested and the root systems examined. In both soil types the two higher rates of CIPC eventually killed the plants. With all rates the weight of roots per pot was reduced in the heavy soil, whereas in the light soil the lowest (3 p.p.m.) rate did not affect root weights. A time-course experiment was carried out simultaneously to determine the toxicity of CIPC at different stages of growth; the same 4 rates of herbicide were applied to garlic in pots of light soil and the plants were examined at intervals of 1, 3 and 7 months after planting. After 1 and 3 months, significant stunting of roots was observed for all rates of CIPC. After 7 months those plants treated with 48 and 192 p.p.m. had died; the plants treated with 3 p.p.m. had recovered and root growth was normal, whereas with 12 p.p.m. the roots were much shorter than those of control plants. In field trials at 4 different sites plants were sprayed with CIPC at 6 and 12 lb./acre either immediately after planting or when the shoots were 4–5 in. high. At 6 lb./acre CIPC did not significantly reduce yields on any plots. With 12 lb./acre applied pre-emergence yields were reduced on one plot; the remaining plots were unaffected. A commercial rate of 4 lb./acre is recommended.

7948. MORAVEC, J., AND KVASNIČKA, S.
Variabilita a vztah některých vlastností česneku (*Allium sativum* L.) k napadení hád'átkem zhoubným (*Ditylenchus dipsaci* Kühn). **(Variability of certain properties of garlic and their relationship to infestation by the stem nematode.)** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 57-66, bibl. 5.

Observations were conducted over 3 years on 42 varieties of garlic, 25 of which belong to the bolting group (subsp. *sagittatum*) and 17 to the non-bolting group (subsp. *vulgare*). The bolting types are characterized by fewer and heavier cloves and a lower degree of nematode infestation. Variability, especially of nematode infestation, was greatest during the most favourable growing season. Yields and degree of nematode infestation were affected by variety and environment. Correlations found between nematode infestation and marketable yields and between infestation and clove weight were negative, but the correlation between infestation and the number of cloves per bulb was positive.

7949. PEJČIĆ, P.
Muva beloga luka, *Suillia lurida* Meig. **(The garlic fly, *Suillia lurida*.)** [English summary ¾ p.] *Zašt. Bilja*, 1964, **15**: 577-83, bibl. 5, illus.

S. lurida recently became a dangerous pest of winter-grown garlic in Yugoslavia, causing up to 90% damage. In control experiments pre-sowing seed treatment with DDT or BHC preparations proved ineffective. Treatment against the adults on 5 March with Diliden or Gamadin at 30 kg./ha. or Pantakan 16·5% at 1 : 99, or on 10 March against the adults and newly laid eggs with Fosferno 20 at 0·15%, parathion 50 at 0·05%, Etiol at 0·25% or Nikotinol at 1% gave promising results. The establishment of a forecasting and warning service is suggested.

7950. SCHULTZ, O.-E., AND MOHRMANN, H.-L.
Beitrag zur Analyse der Inhaltstoffe von Knoblauch—*Allium sativum* L. I. Mitteilung: Dünnschichtchromatographie des Knoblauchöls. **(Contribution to the analysis of the constituents of garlic, *Allium sativum*. Part I. Thin-layer chromatography of the garlic oils.)** *Pharmazie*, 1965, **20**: 379-81, bibl. 7.

Diallyl disulphide was the chief constituent of the essential oils.—Univ. Kiel.

Rhubarb.

7951. RODENBURG, C. M.
Timperley Early, ook in 1964 het vroegste rabarberras. **(Timperley Early, the earliest rhubarb variety again in 1964.)** *Groent. en Fruit*, 1965, **20**: 1729, illus.

In outdoor trials Timperley Early gave the earliest and heaviest yield as compared with Victoria and Paragon. [For earlier work see *H.A.*, 34: 2916.]—Inst. Vered. Tuinbouwgew., Wageningen.

7952. SCHRATZ, E., SCHNELLE, F. J., AND WITT, H.
Die Fortpflanzungsverhältnisse im Genus *Rheum*. **(Reproduction relationships in the genus *Rheum*.)** *Pharmazie*, 1965, **20**: 387-90, bibl. 11.

Vegetative reproduction was possible in all species tested. Cross pollination was the general rule in sexual reproduction.

7953. Kimura, Y., and Miller, V. L.
Estimation of gibberellic acid residue in rhubarb. *J. agric. Food Chem.*, 1965, **13**: 260-1, bibl. 20.
A relatively rapid and specific method sensitive to residues of 0·003 p.p.m., based on adsorption on aluminium oxide, subsequent quantitative elution and thin-layer chromatography.

7954. Ministry of Agriculture, London.
Rhubarb sheds. *S.T.L. Minist. Agric., Lond.*, **37**, 1964, pp. 5, illus.
Requirements, construction (with diagrams), heating, water supply, lighting, ventilation and costs.

Root crops.

(*See also* 7017, 7712.)

7955. Smirnov, P. S.
The significance of the interaction of individual organs in the flowering of plants. [Russian, with English summary ¼ p.] *Fiziol. Rast.*, 1965, **12**: 120-5, bibl. 14, illus.
In the flowering of sugar- and table beets the cold stimulus was detected by the stem buds and passed to the "mother" root when some small leaves had developed. On the other hand, the day-length stimulus could be detected by both buds and rosette leaves, but only a stimulus applied to the rosette leaves could be transmitted via the "mother" root.

7956. Van Steveninck, R. F. M.
The effects of calcium and tris(hydroxymethyl)-aminomethane on potassium uptake during and after the lag phase in red beet tissue. *Aust. J. biol. Sci.*, 1965, **18**: 227-33, bibl. 13.
Both Ca^{2+} and tris(hydroxymethyl)aminomethane (Tris) caused a shortening of the lag phase in net K^+ absorption in beetroot tissue. At pH 8 the effect of Tris was more immediate that that of Ca^{2+}, while the reverse was true at pH 6. At both pH values the effect of Ca^{2+} prevailed when Ca^{2+} and Tris were simultaneously present in the external solution. Experiments with ^{42}K showed that Ca^{2+} caused an immediate depression of the apparent K^+ influx, which lasted from about 6 to 20 hours depending on pH. It was followed by a rapid increase of apparent influx until values 3–4 times that of control treatments were reached. Ca^{2+} also caused an immediate decrease of apparent K^+ efflux which lasted from about 20 to 40 hours. [Author's summary.]—Univ. Adelaide.

7957. Ministry of Agriculture, London.
Beet eelworm. *Adv. Leafl. Minist. Agric., Lond.*, **233**, revised 1965, pp. 6, illus.
Damage by *Heterodera schachtii*, its distribution and host range, transmission and preventive measures, mainly by crop rotation.

7958. Benjamin, W. J., and Scott, R. W.
Growing carrots. *Fmr, Jamaica*, 1965, **70**: 101-4.
Soils and land preparation, varieties, sowing, cultural practices, weed control, harvesting, marketing and control of pests and diseases.

7959. Coleman, B. P.
Continuous carrot production. *N.Z. J. Agric.*, 1965, **110**: 393-401, illus.
Factors of importance in ensuring all-the-year-round carrot production are discussed, including soils and soil preparation, fertilizers, planting, soil moisture, weed, pest and disease control and harvesting.

7960. Bleasdale, J. K. A.
The bed system of carrot growing. *S.T.L. Minist. Agric., Lond.*, **27**, 1963, pp. 18, [received 1965].
Advice is given on this system whereby the field is divided into contiguous beds which can be straddled by a tractor and within which very close row spacings are used. The subjects discussed are land preparation, drilling and plant density, sowing rates and dates, weed control, mechanical harvesting, overwintering and storage.

7961. Austin, R. B.
The effectiveness of light from two artificial sources for promoting plant growth. *J. agric. Engng Res.*, 1965, **10**: 15-18, bibl. 1.
When carrots and cauliflowers were given supplementary illumination for 9 hours per day for 5 weeks in January-February the mean relative growth rate for both species was about 40% greater under a mercury fluorescent reflector lamp than under a mercury tungsten lamp at a given intensity.—Nat. Veg. Res Stat., Wellesbourne, Warwick.

7962. Milov, M.
Herbicides on carrots. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(4): 52.
Maximum weed control and carrot yields were obtained by applying TCA at 15 kg./ha. plus DNC at 1·5 kg./ha. plus ammonium nitrate at 1 centner/ha. before germination, followed by seedling treatment with paraffin at 200 l./ha. at the 4-leaf stage.

7963. Puntuc, L., and Padenov, K.
Herbicides in [sugar] beet and carrots. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(5): 48.
Propazine at 2·5 kg./ha. gave almost 100% control of annual weeds in carrots, but was less effective against perrenial weeds.

7964. Ben-Shaul, Y., and Klein, S.
Development and structure of carotene bodies in carrot roots. *Bot. Gaz.*, 1965, **126**: 79-85, bibl. 16, illus.
Carotene bodies in the carrot root are developed from a membrane-bounded body, a proplastid. Carotenoid pigment crystallizes in the proplastid to form the typical carotene body. A mature carotene body is a pigment crystal composed of superimposed layers. Carotene-starch complexes of orange carrots, as well as pigments and plastids of other varieties of carrots, are also described. [Authors' abstract.]—Hebrew Univ., Jerusalem.

7965. Kononkov, P. F., and Tokmakov, Ju. G.
The influence of foreign supplementary pollination on seed setting in self-pollinated carrots under Moscow conditions. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 247-9.
In trials with 2 carrot varieties the presence of maize or squash pollen increased seed set in self-pollinated plants but was less successful than open pollination within a variety.

966. Gray, E. G.

Carrot rots. *Scot. Agric.*, 1965, **44**: 206-7, illus.

ymptoms are described of rots caused by *Sclerotinia* *clerotiorum, Centrospora acerina, Stemphylium radi-* *inum* and *Helicobasidium purpureum.*

967. Niemczyk, H. D.

Contact toxicity of ten insecticides to adults of the carrot rust fly. *J. econ. Ent.*, 1965, **58**: 423-5, bibl. 10.

opical application of aldrin to adults of the carrot rust y, *Psila rosae*, from Thedford and Bradford, Ontario, nd a comparison of their respective LD_{50} values showed resistance level of ×5,600 in the Bradford strain. pray tower tests on the Bradford strain showed that arathion, Bayer 25141 (*O,O*-diethyl *O-p*(methylsul- hinyl)phenyl phosphorothioate) and naled were the nost toxic; lindane, DDT and pyrethrum were the least oxic; and U.C. 21149 (2-methyl-2-methylthio)pro- ionaldehyde *O*-(methyl-carbamoyl) oxime), malathion, iazinon and Zectran (4-dimethylamino-3,5-xylyl nethylcarbamate) were intermediate in toxicity. [From uthor's abstract. See also *H.A.*, 33: 3141.]—Canada Dep. Agric., Chatham, Ont.

968. Anon.

Diazinon in granular form. *Int. Pest Control*, 1965, 7(3): 25.

ranular diazinon, which persists in the soil for not onger than 16–20 weeks when used at the recommended ates and leaves no undesirable residues, has given 98% ontrol of carrot fly when placed beneath the carrot eed. The correct position for the granules is ½–1 in. elow the seed; the recommended dose for early and ate crops is 1½ lb./acre a.i. on mineral soils and 2 lb. on en soils, and for the main crop 2 lb. on mineral soils nd 2½ lb. on fen soils.

969. Schuphan, W., and Hentschel, H.

Standortgerechter Anbau als wesentliche Voraussetzung für inzektizidfreie Kultur und optimale biochemische Qualität, dargestellt an Möhren (*Daucus carota* L.). **(Proper choice of environment for growing insecticide-free crops of optimum biochemical quality, with reference to carrots.)** [English and French summaries 1 p. each.] *Qual. Plant. Mater. veg.*, 1965, **12**: 145-71, bibl. 43, illus.

he importance of correct habitat is considered in elation to the carrot fly, *Psila rosae*. This pest does ot cause damage provided that the cultivation areas re open and exposed to winds, the soil has a dry surface ut has moisture in the sub-soil, the macroclimate is of ontinental type and the microclimate shows day and ight fluctuations. Suitable cultural practices are also iscussed.—Bundesanst. Qualitätsforsch. pfl. Erzeugn. eisenheim.

970. Láska, P.

Příspěvek k bionomii a ochraně proti *Trioza apicalis* Först (Triozidae, Homoptera). **(A contribution to the bionomics and control of *Trioza apicalis*.)** [German summary ¾ p.] Reprint from *Zool. Listy*, 1964, **13**: 327-32, bibl. 8.

f 7 insecticides tested in laboratory experiments hosdrin (24%) emulsion at 0·6 l./ha. and Fosfotion 33% malathion) emulsion at 1·5 l./ha. gave the most apid kill of overwintered adult *Trioza apicalis* (*T.* *iridula*) on carrots. In trials on residual activity ntration (50% thiometon) at 0·8 kg./ha. and Phosdrin t 0·4 kg./ha. remained effective for over 6 hours.

7971. Láska, P.

Rezidua dieldrinu, lindanu, diazinonu a trichlorphonu v kořenech karotky Nantais. **(Residues of dieldrin, lindane, diazinon and trichlorphon in the roots of the carrot variety Nantes.)** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 105-14, bibl. 15.

At comparable rates of application, soil disinfection with lindane, seed treatment with lindane and row application of diazinon left residues on carrots below the U.S. tolerance limits. Residues after seed treatment with dieldrin were above the tolerance limit. Trichlorphon left residues below 1·6 p.p.m. [See also *H.A.*, 33: 5221.]

7972. Ministry of Agriculture, London.

Parsnips. *Adv. Leafl. Minist. Agric., Lond.*, **151**, revised 1965, pp. 4.

Advice on varieties, culture, lifting and marketing, and parsnip canker.

7973. Banga, O., Petiet, J., and van Bennekom, J. L.

Selecting radish for a more easily threshable silique. [Dutch summary ¼ p.] *Euphytica*, 1965, **14**: 49-58, illus.

Selection for brittle siliquas offers a partial solution of radish threshing problems, because it permits a reduction in the number of rotations of the threshing machine and thereby reduces seed damage. Breeding experiments suggest that siliqua wall thickness is controlled by more than a single gene.—Inst. hort. Plant Breed., Wageningen.

7974. Banga, O.

Praktijkproeven met radijs. **(Practical trials with radishes.)** *Groent. en Fruit*, 1965, **20**: 2355.

Thirteen recommended varieties are listed for growing in static glasshouses and 25 for growing in the open.—Inst. Vered. Tuinbouwgew., Wageningen.

7975. Agarwala, S. C., Sharma, C. P., and Farooq, S.

Effect of iron supply on growth, chlorophyll, tissue iron and activity of certain enzymes in maize and radish. *Plant Physiol.*, 1965, **40**: 493-9, bibl. 35.

Levels of Fe ranging from acute deficiency to excess were supplied to radish plants grown in sand culture. Optimum yield was obtained at a Fe level of 0·1mM. The chlorophyll content was related to the level of Fe supply and tissue concentrations of Fe increased with increasing rates of supply. Synthesis of catalase, peroxidase, phosphorylase and aldolase was depressed by Fe deficiency but recovered if normal levels of Fe were supplied to the plants. Synthesis of acid phosphatase, ribonuclease and transaminase were stimulated by deficiency.—Lucknow Univ., India.

7976. Chiba, K., and Fujiwara, A.

Effects of nucleic acid materials on flowering. I. Influences of ribonucleic acid on the flowering of radish. *Tohoku J. agric. Res.*, 1964, **15**: 175-81, bibl. 12.

Radish plants were grown under natural long- and short-day conditions, and with or without foliar applications of RNA. Under both long and short days RNA stimulated plant growth but not flowering. Plants exposed to 4–6° C. for 20 days during the germination period were completely vernalized. However, plants exposed for 10 and 15 days were not completely vernalized, and in these flower bud initiation and bolting were accelerated by applications of RNA.

7977. Olsen, C. M.
Antagonistic effects of microorganisms on *Rhizoctonia* in soil. *Diss. Abstr.*, 1965, **25**: 3783-4, being *Order No.* 64-13,071 of 158 pp.

In tests with susceptible radish seedlings the highest incidence of damping-off occurred in soil infested with *Rhizoctonia* only, and the lowest incidence occurred in soil containing *Rhizoctonia* plus *Bacillus subtilis*. The incidence of damping-off and the amount of viable fungus recovered from the soil were directly related to each other, and inversely related to the amount of *B. subtilis* added to the infested soil.—Univ. Calif., Berkeley.

Spinach.

(*See also* 6893, 7016.)

7978. Commandeur, J. C.
Rassenproeven met spinazie in de voorjaarsteelt. **(Variety trials of spinach for spring culture.)** *Groent. en Fruit*, 1965, **20**: 1601, illus.

Seventeen varieties were grown on different soils. The new variety No. 803 from R. Zwaan was quick growing and produced a good quality crop. Other varieties which performed well were Virtuosa, Spinoza and Vital R.—Profstat. Groent., Alkmaar.

7979. Troníčková, E., Böhmová, J., and Prugar, J.
Některé chemické vlastnosti sortimentu špenátu. **(Some chemical properties of different spinach varieties.)** [English, Russian and German summaries ½ p. each.] *Věd. Práce ústřed. výzk. Úst. rostl. Výroby v Praze-Ruzyni*, 1965, **8**: 115-25, bibl. 15, illus.

In 46 spinach varieties examined the dry matter content for 3 years averaged from 9·83 to 11·76% and was affected more by the growing season than by the variety. Crinkle-leaved varieties showed slightly lower dry matter contents than smooth-leaved varieties. The Fe content in the dry matter ranged between 55·1 and 281·0 mg. per cent and was usually higher in the dark-leaved than in the light-leaved varieties [see also *H.A.*, 34: 2949]. An outstandingly rich source of Fe was Bloomsdale Long Standing. Oxalic acid contents per fresh weight ranged between 754·0 and 1,061·9 mg. per cent; varietal differences were not significant, but differences due to the growing season were highly significant. In contrast to dry matter and Fe, oxalic acid content was not correlated with either the morphological features of the leaves and plants or with characteristics of their development.

7980. von Sengbusch, R., Sücker, I., and Handke, S.
Untersuchungen über den Gehalt an Oxalsäure in Spinat (*Spinacia oleracea*) als Grundlage für die züchterische Bearbeitung dieses Merkmals. **(Investigations on the oxalic acid content of spinach as a basis for the genetic manipulation of this character.)** [English summary ½ p.] *Züchter*, 1965, **35**: 90-8, bibl. 14, illus.

In field experiments with 16 varieties the oxalic acid content was observed to rise with increasing day length. At harvest time it was low in overwintered varieties harvested in the spring, was highest in a variety harvested in June (total oxalic acid 10·6% dry matter) and became progressively less in varieties harvested at later dates. The oxalic acid content of the whole plant and of the leaves fell with increasing age. There was little difference between varieties, but yields were higher and oxalic acid contents lower with monoecious than with dioecious varieties. Fertilization with nitrate of lime considerably increased the content of insoluble oxalic acid. [See also *H.A.*, 32: 3101.]—Max Planck Inst. Hamburg-Volksdorf.

7981. Nair, P. M., and Vining, L. C.
Phenylalanine hydroxylase from spinach leaves. *Phytochemistry*, 1965, **4**: 401-11, bibl. 20.

This enzyme system, which was only obtained in a partially purified state, catalyses the hydroxylation of L-β-phenylalanine to tyrosine, and appears similar to the enzyme isolated from animal liver. [See also *H.A.*, 35: 5843.]—Nat. Res. Coun. Canada, Halifax, N.S.

Sweet and red peppers and eggplants.

(*See also* 7643.)

7982. Rančjalis, V. P.
A change in the inheritance of characteristics in capsicums by the action of leaf and fruit extracts. [Russian.] *Agrobiologija*, 1965, No. 1, pp. 101-9.

The influence of contrasting capsicum varieties upon one another was studied by grafting two varieties together or by applying extracts from the fruit and leaves of one variety to the other. Morphological changes produced in the first and second seedling generations of both extract-treated and grafted plants varied considerably.

7983. Popova, D.
Použití heterózní metody pří pěstování papriky (*Capsicum annuum*) v Bulharsku. **(The use of heterosis in capsicum growing in Bulgaria.)** [Russian and German summaries ¾ p. each.] *Rostlinná Výroba*, 1965, **11**: 204-12, bibl. 4, illus.

Work in Bulgaria during 1956-1960 is reviewed. Using the early, high quality Hungarian variety Cecei 103, 3 very early hybrids were produced suitable for glasshouse frame or outdoor cultivation. Two new hybrids for grinding were also introduced. In the course of hybrid seed production it was found that pollen stored at 20–22° C. and 50–55% R.H. remained viable for 8–10 days, but after 5–6 days' storage the percentage of fruit set and the average number of seeds per fruit declined. The stigma remained receptive for 5–7 days after emasculation. [See also *H.A.*, 34: 6907.]

7984. Heiser, C. B., Jr.
Los chiles y ajíes (*Capsicum*) de Costa Rica y Ecuador. **(The red and sweet peppers of Costa Rica and Ecuador.)** [English summary ¼ p.] *Cienc. Nat.*, 1964, **7**: 50-7, bibl. 10, illus.

C. pubescens, *C. annuum*, *C. pendulum*, *C. frutescens* and *C. chinense*: key and notes with drawings of the fruits.

7985. Holovláska, H.
Československý sortiment papriky koreninovej (*Capsicum annuum* L.). **(The Czechoslovak varieties of red pepper.)** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 17-26, bibl. 1.

Five varieties suitable for different pepper growing areas are described.

7986. Kamalam, N., and Rajamani, T. S.
A note on the pungency studies in some varieties of chillies grown in the Agricultural Research Station, Koilpatti. *Indian J. agric. Sci.*, 1965, **35**: 67-8, bibl. 1.

The varieties Assam B.72A and B.70A, Ceylon C.6.3A5, Bihar B.24A2 and the local Sattur Samba were studied. High capsaicin content of the fruit appeared to be associated with low plant height. B.24A2 was the shortest and most pungent but produced the smallest yield of dry chillies; B.72A offered a reasonable compromise between yield and pungency.—Agric. Coll. and Res. Inst., Coimbatore.

7987. Gottl, R.
College Gold, a new capsicum variety. *Agric. Gaz. N.S.W.*, 1965, **76**: 152-4, illus.

This new variety is described; it has a very high vitamin C content (183 mg./100 g. fruit).

7988. Bulboacă, M., and others.
Cercetări cu privire la cele mai potrivite scheme de plantare a ardeiului iute cultivat în sere. **(Studies on the best planting methods for capsicums grown under glass.)** [French and Russian summaries ⅔ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 127-32, bibl. 4.

In 3 years' trials, during which 4 methods of planting were compared, the highest yields were obtained with a 25 × 25 cm. spacing with a 50 cm. gap between the rows.

7989. Maier, I., and others.
Cercetări cu privire la stabilirea densităţii optime în cultura de seră a ardeiului gras. **(Studies on the best spacing distances for growing sweet peppers under glass.)** [French and Russian summaries ¾ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 133-40, bibl. 3.

Three spacings were compared: 30 × 40, 40 × 40 and 50 × 40 cm. The highest total and early yields were obtained from the widest spacing.

7990. Hovadík, A., and Vlček, F.
Vliv živin na mikrobní osídlení rhizosféry papriky v hydroponickém roztoku. **(The effect of nutrients on the microbial population in the rhizosphere of peppers in nutrient solution.)** [English, Russian, and German summaries ¼ p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 77-82, bibl. 4.

The total number and the specific composition of micro-organisms were affected by the concentration of the nutrient solution. Populations on pepper roots were several times higher than in the solution and declined during 3 months of cultivation. Some correlation was found between the microbial populations and yields.

7991. Hovadík, A., and others.
Rhizosférní mikroflóra a kořenové výměšky papriky. **(The microflora of the rhizosphere and the root secretions of peppers.)** [English, Russian and German summaries ¼p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 83-94, bibl. 21, illus.

Determinations carried out during 5 stages of growth showed considerably higher bacterial populations on the roots than in the rhizosphere of pepper plants. The larger quantity of root bacteria found during early growth and the smaller quantity found during late growth agreed with results of chromatographic analyses of root secretions. [See also *H.A.*, 34: 2672.]

7992. Hovadík, A.
Vliv extraktů a kořenových výměšků paprik na klíčení některých semen zeleniny. **(The effect of extracts and root secretions of capsicums on the germination of some vegetable seeds.)** [English, Russian and German summaries ⅓ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 151-62, bibl. 9.

Aqueous extracts were prepared from the leaves and roots of capsicum plants at 3 stages of development, and root secretions were obtained at 2 stages of development. The effects of different concentrations of these solutions on seed germination were tested on capsicums, tomatoes, carrots, cucumbers, lettuces and kohl-rabi. Both stimulation and inhibition were observed in the different test plants. The greatest inhibition was caused by leaf extracts from old capsicum plants. [See also *H.A.*, 34: 2672.]

7993. Dempsey, A. H., and Cochran, H. L.
Effect of fruit shape on the occurrence of internal mold in cannery pimientos. *Plant Dis. Reptr*, 1965, **49**: 157-8, bibl. 4, illus.

In 1963 the incidence of internal mould, classified as a physiological disorder, was greater in blunt and off-type than in heart-shaped and pointed fruits of the capsicum variety Truhart Perfection.—Ga Exp. Stat., Experiment.

7994. Ghabrial, S. A., and Pirone, T. P.
Physiological changes which precede virus-induced wilt of Tabasco pepper. From abstr. in *Phytopathology*, 1964, **54**: 893.

Tabasco pepper seedlings, grown in sand culture, were rinsed and the roots immersed in distilled water. The leaves were inoculated with tobacco etch virus. Conductivity measurements showed that a marked release of electrolytes, indicative of a change in permeability, occurred 24–36 hours before the plants started to wilt, and 48–72 hours before severe wilt developed. No such release of electrolytes occurred with non-inoculated controls or with inoculated plants of TEV-susceptible pepper varieties which do not wilt as a result of infection. No respiratory change occurred until 12 hours after electrolyte release was pronounced, at which time a decrease in O_2 uptake was detected. The respiratory rate then decreased steadily, and at the time of incipient wilt was about 50% below that of non-inoculated controls. Stained sections, prepared from roots of healthy and inoculated Tabasco seedlings, showed no phloem or cambium necrosis at the time of pronounced electrolyte release. However, disruption of both cambium and phloem tissue was observed on the first day of wilt, as had been previously reported. Thus electrolyte loss precedes the respiratory change, as well as the histological and wilt symptoms induced by TEV.—La St. Univ., Baton Rouge.

7995. Morton, D. J.
Detecting *Xanthomonas vesicatoria* in *Capsicum frutescens* leaves by bentonite flocculation. *Phytopathology*, 1964, **54**: 1037, bibl. 3.

The method described. [See also *H.A.*, 35: 5859.]

7996. Morton, D. J.
Use of antibodies conjugated with fluorescein isothiocyanate in ultraviolet examinations of pepper leaf sap for *Xanthomonas vesicatoria*. From abstr. in *Phytopathology*, 1964, **54**: 902.

Details are given of a method developed for identifying *X. vesicatoria* in crude sap from capsicum leaf lesions. [See also *H.A.*, 35: 5859.]

7997. Wilson, J. D., and Hedden, O. K.
Effect of spray gallonage and leaf character on deposition and retention of copper-containing fungicides. From abstr. in *Phytopathology*, 1964, **54**: 913.

Initial deposits of tribasic copper sulphate on a given plant varied little with 25 to 200 gal. of water per acre. The initial deposit of Cu was considerably higher, however, on a highly pubescent eggplant leaf than on a smooth capsicum leaf. After 10 days of weathering, the quantity of Cu remaining on the foliage was much greater with eggplant than with capsicum, the latter being devoid of Cu in some instances. At 25 gal. the weathered deposit was 2·5 times as great on eggplant as on capsicum, and this increased to 3·4 at 200 gal. In an average of 6 spray intervals on 4 different vegetables, the weathered deposit was 6·5 µg./sq. cm. of leaf area with 25 gal. of water. This decreased to 3·4 µg. with 200 gal. When dew-wet leaves were sprayed at 100 gal., the initial deposit of Cu was less than when dry leaves were treated, but the percentage of adhesion after weathering was slightly higher with leaves which were wet when sprayed.—Ohio agric. Exp. Stat., Wooster.

7998. Hristov, S., Manueljan, H., and Kovačev, A.
Changes in the dry matter, sugars and colour of fruits of capsicum milling varieties during ripening. [Bulgarian, with English and Russian summaries ½ p. each.] *Grad. lozar. Nauka*, 1965, **2**: 185-91, bibl. 4.

A 3-year study showed that, after reddening, the fruits of the variety Gorogled 6 increased rapidly in dry matter content, whereas those of Novoselska Kapija 379 and Plovdivski Ljut remained more or less constant. During the same period the sugar content declined continuously in all 3 varieties, the decrease being between 30 and 40%. Colouring substances increased after reddening, the final value being 150 mg.% higher in Gorogled 6 than in the other varieties.—"Marica" Veg. Crops Inst., Plovdiv.

7999. Empig, L. T., Sumaoang, J. T., and Bernardo, F. A.
Incorporation of genes controlling clustered fruiting habit into five Philippine eggplant varieties. *Philipp. Agric.*, 1964, **48**: 113-27, bibl. 11, illus.

The varieties Bulacan, Sinampiro, Golden Gate, Batangas and Cagayan were crossed with Line 401. In addition to genetical studies a taste test of the parents rated them in the above order. The first 3 had the lowest percentage seed content.

8000. Frydrych, J.
Květní biologie lilku jedlého (*Solanum melongena* L.). **(The floral biology of eggplants.)** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 27-37, bibl. 4, illus.

Self-fertility found in eggplants was due partly to the structure of the flowers and partly to the absence of pollinators. In hybrid seed production it was not necessary to isolate emasculated from cross-pollinated flowers. Immediately after the anthers opened pollen germination was about 50%, but rapidly declined with age. Only the earliest flowers were suitable for crossing as fruit which set later did not mature and produce viable seeds.

8001. Rajki, E., and Pál, G.
Az oltóágként használt növény egyedfejlődés állapotának hatása a megeredésre és az oltvány egyes tulajdonságaira. **(The effect of the developmental stage of the plant used as scion on the take and certain properties of the graft.)** [English and Russian summaries 2 pp. each.] *Növénytermelés*, 1965, **14**: 55-66, bibl. 6.

Purple and white eggplants in 4 different growth stages were grafted on themselves and on each other when the rootstocks were in the 7–8 leaf stage, producing P/P W/W, P/W and W/P plants. Graft union and fruit production, on the average, were most successful when the scions were in the bud-to-flowering stage, then in descending order, in the 1–2-true-leaf, germinating and cotyledonary stages. The developmental stage of the scion at grafting affected the number of fruits per plant and the number of seeds both per plant and per fruit. The reproduction coefficient, i.e. the number of seeds produced by one seed in one generation, in the purple eggplant was 768·10 and in the white 4,954·10 whereas in the grafts, irrespective of the rootstock, the coefficient in the purple scion was 179·31 and in the white 696·61.

8002. Maier, I., and others.
Cercetări cu privire la dirijarea creşterii şi dezvoltării pătlăgelelor vinete cultivate în sere prin operaţia de copilire. **(Studies on the contro of the growth and development of eggplants grown under glass.)** [French and Russian summaries ⅔ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu Ser. B*, 1964, **7**: 111-18, bibl. 2.

Plants of the variety Bucureştene, pruned so as to leave the main stem with either one or two laterals, were compared with unpruned plants. The number o flowers produced was inversely proportional to the severity of the pruning, but the number of fruits produced bore a direct relationship to the degree of pruning Taking into account both the early and the total crop the less severe pruning is recommended.

8003. Mountain, W. B., and McKeen, C. D.
Effects of transplant injury and nematodes on incidence of *Verticillium* wilt of eggplant. *Canad. J. Bot.*, 1965, **43**: 619-24, bibl. 6.

Verticillium dahliae apparently utilized injured cortica tissue to reach the vascular elements in eggplant roots The 2 major sources of such root injury in sandy soil were transplanting injury and the root lesions caused by *Pratylenchus penetrans.* The effect of both factors acting independently, on disease incidence appeared to be about the same. [From authors' abstract.]—Canada Dep. Agric., Harrow, Ont.

8004. Basu, A. C., and Pramanik, L. M.
Tests of some insecticides against *Tetranychus telarius* Linnaeus (Tetranychidae : Acarina) infesting brinjal in West Bengal. [German and Russian summaries ½ p. each.] *Beitr. Ent.*, 1965, **15** 175-8, bibl. 6.

In preliminary tests with potted eggplants Trithion malathion and Thiodan all controlled the mite, Trithion the most effectively.

8005. Lall, B. S., and Ahmad, S. Q.
The biology and control of brinjal (egg-plant) fruit and shoot borer, *Leucinodes orbonalis.* *J. econ Ent.*, 1965, **58**: 448-51, bibl. 16, illus.

The biology of the pest and the damage caused are described. Of the eggplant varieties tested Aushey was found highly resistant. Tri-weekly spraying with endrin (0·02%) provided fair control of the pest. [From authors' abstract.]—Bihar Coll. Agric., Sabour, Bihar, India.

Tomatoes—general.

(*See also* 7632, 8102.)

8006. Bharath, S.
Tomato growing. *J. agric. Soc. Trin. Tob.*, 1965, **65**: 17-33.

Advice on field, glasshouse and hydroponic culture in Trinidad.

8007. Ministry of Agriculture, London.
Outdoor tomatoes. *Adv. Leafl. Minist. Agric., Lond.*, **360**, 1964, pp. 6.

Advice is given on varieties, culture, marketing and the control of potato root eelworm, cutworms and leatherjackets, blight (*Phytophthora infestans*), stem and fruit rot (*Didymella lycopersici*), and aspermy, cucumber mosaic and tomato mosaic viruses.

8008. Sims, W. L.
Growing tomatoes in your home garden. *Publ. Univ. Calif. agric. Ext. Serv.* **AXT-132**, 1964, pp. 17, illus.

Advice on varieties, planting, culture and storage, and control of diseases and pests.

8009. Corgan, J. N.
Greenhouse tomatoes can be profitable winter-spring product. *New Mex. Ext. News*, 1965, **45**(2): 4-5.

Advice on cultural practices, varieties, insect and disease control, and costs.

8010. Amsen, M. G.
Den økonomiske betydning af tidlighed—kvalitet og udbytte hos tomater. **(The economic importance of earliness—quality and yield in tomatoes.)** *Gartner Tidende*, 1965, **81**: 379-83.

The author discusses different aspects of earliness and the economic effect of earliness on the basis of trials from 1959 to 1961. It is pointed out that prices in September and October are sufficiently high and stable to encourage the growing of long season varieties in Denmark.

8011. Nicholson, J. A. H.
Growing tomatoes without guesswork. *Agriculture, Lond.*, 1965, **72**: 348-51, bibl. 1, illus.

A brief discussion on the use of growers' records for management purposes.—Wye Coll., Kent.

Tomatoes—breeding and varieties.

8012. Betlach, J.
Výzkum kombinačních schopností některých vybraných odrůd rajčat. Výsledky spolupráce vědeckých pracovníku státu RVHP. **(Investigations on the combining capacities of certain selected tomato varieties. Results of co-operation between scientific workers in countries of the Council of Mutual Economic Aid.)** [English, Russian and German summaries ⅓ p. each.] *Rostlinná Výroba*, 1965, **11**: 61-70, bibl. 9.

n 3 years' trials in 6 countries, 2 indigenous tomato arieties were crossed with 2 varieties each from the ther 5 countries. In Czechoslovakia the variety tupické Polní Rané as the female parent produced etter F_1 hybrids, with regard to earliness and yield, than did Průhonický Universal. The use of male parents from colder countries gave better results, especially during unfavourable weather conditions, than the use of varieties from warmer climates. The best F_1 hybrids were obtained from Stupické Polní Rané crossed with Krakowskie Wczesne, Mory 33 (both from Poland), Štambovyj Alpatjeva (U.S.S.R.) or Strain F55/202 (East Germany).

8013. Betlach, J.
Výzkum vlivu ekologických podmínek na projev heterosního efektu u F_1 generace rajčat. **(The influence of ecological conditions on the heterosis effect in F_1 tomatoes.)** [English, Russian and German summaries ½ p. each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 7-16, bibl. 9.

Seeds of 2 hybrid tomatoes and their parents were produced in Bulgaria and Czechoslovakia in 3 years' trials, and tested in both countries. It was found that growing the parents under different conditions for one year had no appreciable effect on the expression of hybrid vigour with regard to early and total yields or on morphological or biochemical characteristics.

8014. Alvarez-Luna, E.
A study of inheritance of fruit firmness in the tomato (*Lycopersicon esculentum* M.). *Diss. Abstr.*, 1965, **25**: 3777, being *Order No.* 64-13,767 of 222 pp.

Data from segregating generations following crosses between selected firm-fruited lines and commercial soft-fruited varieties were used. A modification of the apparatus described by Hamson [*H.A.*, 23: 3196 l] was used to measure firmness.—Cornell Univ.

8015. Thompson, A. E.
Breeding tomato varieties with increased resistance to fruit cracking. *Ill. Res.*, 1965, **7**(2): 12-13, illus.

The selection of resistant varieties by the vacuum-immersion method.

8016. Thompson, A. E.
Crimson—a new color of tomato fruits. *Ill. Res.*, 1963, **5**(1): 19.

Analyses of a breeding line with crimson fruits, obtained from Canada but having originated in the Philippines, showed that the ratio of total pigments (mainly lycopene) to carotene was high owing to a slight reduction in carotene content. Fruits obtained by crossing crimson with so-called high-pigment varieties, which contain twice as much lycopene and carotene as standard varieties, had a high total pigment content combined with the carotene level of a normal tomato. These data are tabulated.

8017. Odland, M. L., and Fletcher, R. F.
Greenhouse tomatoes tested for Pennsylvania. *Science for the Farmer*, 1965, **12**(4): 14, 16, illus.

Twelve varieties (including both pink and red types) were compared for autumn cropping and 24 for spring cropping in preliminary trials under glass. The red varieties gave better results than the pink which were very sensitive to cultural treatment. Yields, fruit characteristics and disease resistance ratings for all varieties are tabulated.

8018. Van Bastelaere, H.
Tomatenrassenvergelijking onder koud glas 1964. **(Comparison of tomato varieties under cold glass, 1964.)** *Meded. BedrVoorlicht. Oost-Vlaanderen* **30**, 1965, pp. 2.

Another account of work abstracted in *H.A.*, 35: 3656.

8019. GALLE, E. E. C.
Tomatoes for the Western Cape. *Fmg S. Afr.*, 1965, **41**(4): 9, 13, illus.

Urbana and Earliana T46 compared favourably with Pearson (the most widely grown variety in the Western Cape) for earliness and yield. Fireball (a dwarf type) was also early maturing. Descriptions of the 3 varieties are included.

8020. KARTALOFF, P.
Prüfung von Tomaten- und Gurkensorten in Bulgarien. **(Tomato and cucumber variety trials in Bulgaria.)** [Russian and English summaries ⅓ p. each.] *Arch. Gartenb.*, 1964, **12**: 605-11, illus.

In trials under glass the Harzfeuer tomato variety ripened considerably earlier than No. 10 × Bison. Harzfeuer had a more uniform and rounder shape; it was firm, smooth and pulpy, did not split and had no green and yellow spots around the calyx. The cucumber varieties Spiers, St. 55/87 and St. 590 ripened later than Stara-Zagoraer Langi, but their total yields were larger. Stara-Zagoraer Langi is recommended, however, because of its straight shape.—Landw. Hochsch. W. Kolaroff, Plovdiv.

8021. KLUGE, K.
Stabtomatensorte "Harzfeuer" für den Freilandanbau geeignet. **(The indeterminate tomato variety Harzfeuer is suitable for field cultivation.)** *Dtsche Gartenb.*, 1965, **12**: 129-30.

Harzfeuer, normally recommended for growing under glass, compared favourably with the field varieties Beyms Erntesegen and Apollo. It ripened earlier, produced higher yields and had greater market value.

8022. CORDNER, H. B., THOMSON, H., AND GALEOTTI, C.
Origin and development of the Nemared tomato. *Bull. Okla. St. Univ. Exp. Stat.* **B-635**, 1965, pp. 19, bibl. 6, illus.

The nematode-resistant, high-yielding variety Nemared is discussed under the following headings: yield, description, origin and development, screening for nematode resistance and nematode resistant F_1 hybrids.

8023. LUNEVA, M. Z.
The new tomato variety Ostankinskij 121. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 54, pp. 28-31, illus.

This determinate tomato produces heavy crops of fruit which does not crack and keeps for 1½–2 months.

Tomatoes—seed treatment, seedling production and rootstocks.

(*See also* 7731, 7780.)

8024. GEORGIEV, H.
Research into the sensitivity of tomato seeds to ionizing irradiation. [Bulgarian, with English and Russian summaries ¾ p. each.] *Grad. lozar. Nauka*, 1965, **2**: 177-84, bibl. 7.

The effects of X-rays, γ-rays and thermal neutrons on germination, growth and vigour were studied. The optimum dose of X-rays and γ-rays, namely the highest dose which did not kill any seeds, was 30,000 r.; 40,000 r. killed 50% of them and 60,000 r. nearly all of them. For neutron treatment the equivalent dosages were 6,000, 8,000 and 10,000 rep. The X-rays and γ-rays affected germination, growth and vigour equally, whereas neutrons had relatively less effect on germination. No varietal or hybrid differences were observed. Dry atmospheric conditions increased sensitivity and the smaller seeds were more susceptible to reduction in vigour.—Inst. Plant Growing, Sofia.

8025. ČIRKOVA-GORGIEVSKA, M., AND PETROV, G.
A contribution to the study of stimulation in tomatoes (*Lycopersicon esculentum*). [Macedonian with German summary ¾ p.] *Annu. Fac. Agric. Sylvic. Skopje, Agric., 1961-62*, 1962, **15**: 177-82, bibl. 8.

Treating tomato seeds for 2 hours with 0·3% KBr, 0·2% KBr+0·1% NaBr or 0·3% NH_4Br stimulated germination and produced vigorous seedlings. The best early yields were produced by plants grown from seeds treated for 1, 2 or 3 hours with 0·1% $FeSO_4$ or from those treated for 2 or 3 hours with 1·5% $MgSO_4$ – 1·5% $MnSO_4$. When the seeds and the roots of seedlings from the treated seeds were treated, 0·3% KBr for 2 or 3 hours gave very good results.

8026. ATANASOV, N.
The possibilities of substituting polythene for glass in tomato seedling production. [Bulgarian, with English and Russian summaries ½ p. each.] *Grad. lozar. Nauka*, 1965, **2**: 205-12, bibl. 9.

The substitution of polythene for glass in houses used for raising tomato seedlings had little effect on the duration of the various growth stages, but the polythene-grown seedlings were shorter with thinner stems and less top growth, and cropped rather later than those grown under glass.—Combined exp. Stat., Negovan.

8027. YOSHIE, S., AND SHIMADA, N.
Nutrio-physiological studies on vegetable seedlings. (2) On the temperature of the seed-bed and the composition of tomato seedlings. [Japanese, with English summary ¼ p.] *Tech. Bull. Fac. Hort. Chiba*, 1964, No. 12, pp. 69-74, bibl. 21.

Soil temperatures in the seed-bed were maintained at 20°, 25° or 30° C. for about 20 days before transplanting the seedlings into the field. Seedlings kept at 25° or 30° were taller and showed increased fresh weight and leaf weight/stem ratios, and decreased dry weight compared with those raised at 20°. However, after planting-out the latter outgrew the former and produced higher yields. The total sugar content and the amount of sugar synthesized after planting out were highest in seedlings raised at 20°. Seedlings raised at 25° and 30° showed a slightly higher moisture content and uptake of mineral nutrients compared with those raised at 20°. [For part 1 see *H.A.*, 34: 4997.]

8028. TAKAHASHI, K.
Studies on composts for raising vegetable seedlings in hot-beds. V. Some chemical changes during composting and growth responses of tomato seedlings to composts of various compositions. [Japanese, with English summary ½ p.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 335-44, bibl. 23.

Chemical changes were studied in mixtures of soil plus rice straw or leaf mould fertilized with calcium cyanamide. Tomato seedlings made vigorous growth in a straw compost with a low N content and in leaf mould composts with low and medium N contents. However, germination and growth were retarded by straw composts with medium and high N contents and by leaf mould with high N. Seedlings in a straw compost containing high N suffered from leaf burn and eventually died. Analyses of composts showed that those producing toxicity symptoms had an extremely high ammonia-N content and pH, and a low nitrate-N content. Large amounts of dicyandiamide and guanidin were also detected. Sand culture trials showed that the toxicity symptoms were similar to those induced by cyanamide derivatives rather than to those produced by a high ammonia-N content. [For part IV see *H.A.*, 35: 5533.]

8029. Shackleton, D. A.
Grafting tomatoes. *N.Z. comm. Gr*, 1965, **20**(11): 21, illus.

Solanum sodomaeum, *S. auriculatum* and the native *S. laciniatum* were successfully grafted with tomato scions. Growth was restricted and fruit size reduced in plants grafted on the first 2 species, but plants on stocks of *S. laciniatum* withstood saturated soil conditions (unlike ungrafted tomatoes in the same field) and continued to grow for almost 2 months longer than the ungrafted plants. The graft consisted of single cuts on stock and scion held together by a spring-clip clothes peg.

Tomatoes—training and pruning.

8030. Schoppers, A. J.
Het doortelen van tomaten. **(Growing-on tomatoes.)** *Groent. en Fruit*, 1965, **20**: 2059, illus.

Six methods of "layering" or training tomatoes for a second crop, and the labour requirements for each, are compared. Training over the pathway could give the best results provided there was sufficient space between the plants and the glass to allow full air circulation and that shade was available when necessary. Training the shoots up into the guttering space also proved satisfactory. Least work was entailed when plants were trained downwards over the same strings; training them over the picking wires after guiding the shoots underneath involved the most work.—RTC, Naaldwijk.

8031. Bălaşa, M., Voican, V., and Faur, G.
Înfluenţa diferitelor procedee de copilit asupra producţiei de tomate timpurii şi semitimpurii. **(The influence of various thinning methods on early and medium early tomato crops.)** [English, Russian and French summaries 12 lines each.] *Grăd. Via Liv.*, 1965, **14**(3): 7-18.

Thinning trials are reported which showed that increases in early and total yields are governed by the distribution of the inflorescences on the main stem and side shoots rather than by the number of inflorescences present. Maximum yields were obtained when inflorescences developed on the most vigorous side shoots as well as on the main stem.

Tomatoes—soilless culture, nutrition and salinity.

(*See also* 7702, 7739, 7897, 8066.)

8032. Smirnov, N. A.
Glasshouse vegetable culture on artificial media. [Russian.] *Vestn. sel'sk. Nauki*, 1965, **10**(2): 46-51, illus.

Trials are reviewed in which tomatoes and cucumbers were grown with culture solutions on gravel, keramzit [porous clay filler], vermiculite and perlite media. Small granule (7–15 mm.) keramzit is recommended as the most suitable medium owing to its stability in nutrient solutions.

8033. Pospíšilová, J., Toul, V., and Vlček, F.
Studie obsahu některých mikroprvků v živných roztocích a vliv nadbytku zinku. **(Studies on the content of some microelements in nutrient solutions and the effect of an excess of zinc.)** [English, Russian and German summaries ½ p. each.] *Věd. Práce výzk. Úst. zelin. v Olomouci*, 1964, **3**: 47-76, bibl. 54, illus.

Tomatoes were grown in soilless culture on 6 different substrates, and the Zn, Cu, Fe, Mn and Mo contents of the nutrient solution were analysed 4 times at weekly intervals. The content of Zn increased and that of Cu decreased as a result of the release of Zn from the zinc-coated nutrient supply vessels. The content of Fe was lower, and that of Mn approached the normal lower limit for nutrient solutions. The Mo content was adequate. The plants did not show any signs of damage. Yields were highest on a substrate of crushed basalt plus peat and lowest on slag but were not directly related to the Fe : Mn ratio. In experiments with kohl-rabi, increasing the nutrient concentration of the solution increased the Zn content of both the solution and the plants. Plant injury became apparent at a Zn concentration of 10 mg. per 1,000 ml. solution when the Zn concentration in the roots reached 325·1 mg. and in the leaves 50·6 mg. per 100 g. of dry matter.

8034. Roll-Hansen, J.
Tomatplanter i tørv. **(Tomato plants in peat.)** *Gartner Tidende*, 1965, **81**: 393-5, illus.

In trials over 20 years tomatoes have been grown successfully in peat. The formula used is 1 cu. m. shredded peat (original pH about 4·5), 2 kg. dolomitic lime, 2 kg. of a complete fertilizer (11·5% N, 5% P, 14·5% K+Mg, S and B) and 1 g. sodium molybdate, giving a final pH of about 5·4. Recommendations for growing tomato plants in peat are outlined. When a peat mixture without Mo was used in Jiffy pots a marked deficiency of Mo occurred. Other Scandinavian work on growing tomatoes in peat is noted. [See also *H.A.*, 34: 6947.]—St. Forsøgsgård Kvithamar, Stjørdal, Norway.

8035. Van Bastelaere, H.
Vloeibare bemesting. **(Liquid fertilization.)** *Meded. BedrVoorlicht. Oost-Vlanderen* **28**, 1965, pp. 8.

Advice on liquid fertilization of glasshouse tomatoes.

8036. Torev, A. K.
The mushroom as a stimulant of plant growth and development. [Russian.] *Bot. Žurnal*, 1965, **50**: 528-32, bibl. 5.

In experiments in Bulgaria tomatoes grown in gravel culture were supplied with a nutrient solution containing 0·2, 0·1, 0·02 or 0·01% mushroom [*Agaricus campestris*] tissues. The higher rates retarded growth and yields, but the 2 lower rates, and especially the 0·02% treatment, stimulated growth and greatly increased yields. In field trials a powder prepared from mushroom stalks was applied either before irrigation as a top dressing with a fertilizer at 8 kg. plus 120 kg. of N fertilizer per ha. at 5–6 g. per plant, or alone as a preplanting treatment at 200–250 mg. of powder per planting hole. The growth of the tomato plants was not affected, but ripening was advanced by about 15 days, early yields raised by 60% and returns increased by 20–25%.

8037. Palevich, D., and others.
The effect of manure and fertilizer treatments on the yields of winter tomatoes in the western Negev. *Israel J. agric. Res.*, 1965, **15**: 65-72, bibl. 11.

Nitrogen fertilizer and manure improved yield distribution and increased total yield, weight per fruit and height of plants of winter tomatoes, var. Moneymaker, grown in a loamy sand low in organic matter and available N and rich in available P and K. At medium levels of P an increase in the amount of N applied resulted in a progressive increase in total yields from about 3·2 to 7·0 tons per dunam. The effect of P on yields was significant only with high levels of N; no effect was found on plant height or fruit weight. K fertilizers caused a significant reduction in yields from 7·5 tons/du. for the control to 5·1 tons/du. for the rate of 60·76 kg. K/du; no effect was found on plant height or fruit weight. Cow manure applied in addition to N and P fertilizers significantly increased yields by 14-41% in comparison with plots which received the same amounts of N and P but without manure. [From authors' summary.]—Hebrew Univ., Rehovot.

8038. Barooah, S., and Ahmed, A. Z.
NPK trial on tomato. Response to NPK fertilizers, at different levels, on growth, yield and ascorbic acid content of tomato. *Indian J. Agron.*, 1964, **9**: 268-72, bibl. 15.

N, P and K at 0, 60 and 120 lb./acre were applied in 27 different combinations to the variety Ponderosa. The growth, branching, ascorbic acid content and yield increased with rising applications of N. The application of N at rates above 120 lb./acre gave lower yields. Plants receiving P grew much faster in the early stages, but P application beyond 60 lb. resulted in lower yields. Potash had little effect on the yield but significantly increased the ascorbic acid content. The interaction N×P was found to be significant for growth and yield.—Assam agric. Coll., Jorhat.

8039. Somos, A., and Sovány, Z.
A paradicsom vízforgalmának alakulása különböző tápanyagellátottság esetén. **(The water economy of tomatoes at different levels of nutrition.)** *Magy. Tud. Akad. Közlem.*, 1964, **23**(1/2): 1-33, from *Hung. agric. Rev.*, 1965, **14**, Abstr. 54.

The transpiration coefficient, fresh and dry weights and the coefficient of water utilization were determined in pot-grown tomatoes supplied with different levels of N, P, and K.

8040. Steineck, O.
Der Einfluss steigender Ionenkonzentrationen N und K auf den Mineralstoffgehalt von Tomate (*Solanum lycopersicum* L.) bei konstanter Darbietung. **(The effect of a constant supply of increasing concentrations of N and K ions on the mineral composition of tomato.)** [English summary ⅔ p.] *Bodenkultur*, 1964, **15**: 340-58, bibl. 5.

In tests carried out in the spring of 1962 with the variety Bonny Best NH_4NO_3 and K_2SO_4 were supplied in ratios of from 1 : 1 to 1 : 8 of both N : K and K : N. An adequate supply of other nutrients was ensured and their absorption was determined as percentages dry weight of root and shoot. Potassium, P and Mg concentrations were always higher in the root, whereas the Ca concentration was always higher in the shoot. With an increasing N supply the N content steadily increased, whereas the relative content of K and other nutrients declined. The relative amounts of nutrients were n affected as much by increasing K supply. [See a *H.A.*, 35: 3269.]

8041. Stancu, E.
Influenţa microelementelor: mangan, bor, f şi zinc asupra compoziţiei chimice a tomatel **(The influence of the microelements mangane boron, iron and zinc on the chemical compositi of tomatoes.)** [English and French summar ⅛ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, S B*, 1964, 7: 119-26, bibl. 8.

In 3 years' experiments with the dwarf variety Stone applications of Mn, B and Fe increased the sugar a ascorbic acid contents, Mn to the greatest extent and the least. Zn had a depressing effect on the ma tomato constituents. Titratable acidity was not affec by these microelements. Plants receiving Mn appli tions produced the highest yields.

8042. Yih, R. Y., and Clark, H. E.
Carbohydrate and protein content of boro deficient tomato root tips in relation to anato and growth. *Plant Physiol.*, 1965, **40**: 312- bibl. 14, illus.

Lateral buds were removed from tomato plants gro in nutrient solutions, all top growth taking place fr the apical meristem. Where adequate amounts of were present in solution, the rate of root elongation w constant and linear. When B was omitted, the ro ceased elongating within 24 hours. The rates elongation were not correlated with the carbohydrate N content of the root tips. When plants grown with B were shaded, the roots elongated more than those unshaded plants before growth ceased. With or wi out B, shading reduced the dry weight, protein a carbohydrate content of the root tips; with or with shading, B-deficient root tips contained more prot and carbohydrate than the controls.—Rutgers St. Uni N.J.

8043. Martens, N. G. C.
Experiments on the calcium nutrition of tomato [Dutch.] *Jversl. Roermond 1963*, pp. 19-20, fro abstr. in *Informationsdienst Weihenstephan*, 196 No. 6, p. 86.

Sandy soils, with a relatively high humus content a pH 5·5, were supplied with 50, 100 or 150 kg. Ca/1 sq. m. Yields decreased slightly with rising appli tions, but the amount of blossom-end rot decline With 100 kg. Ca/100 sq. m. only 7·5% of the fr were affected by blossom-end rot, compared with 23 in the controls.

8044. Brandenburg, W.
Value and use of carbon dioxide on glassho tomatoes. *N.Z. J. Agric.*, 1965, **110**: 227- illus.

In small-scale trials CO_2 was released into the gla house atmosphere either from cylinders or dry ice, or burning hydrocarbon fuels. With dry ice, yield i creases in a 3,000-sq. ft. house were 6% in October, 10 in November, 16% in December and 11% in Januar The corresponding increases for a 1,400-sq. ft. hou were 19%, 5%, 6½% and 5%. By burning aviati turbine kerosene, yields in a 3,000-sq. ft. house we increased by 5·2% in November, 11·1% in Decemb and 3% in January over those in untreated houses.

8045. Roche, H. W.
Field use of CO_2. *Amer. Veg. Gr*, 1965, **13**(5): 13, 59, illus.

Trials in California, using CO_2-filled polythene tunnels, have resulted in increased growth and blossoming in field-grown tomatoes and cucumbers. Warm CO_2 is produced by a propane burner and automatically injected into the tunnels at intervals to maintain a concentration of 600–2,000 p.p.m.

8046. Wilcox, G. E.
Tomatoes tell potassium needs. *Bett. Crops*, 1965, **49**(1): 4-7, illus.

Trials on 2 Miami silt loam soils are briefly reported. One soil contained 180 lb./acre of exchangeable K_2O, and an application of 150 lb./acre of K fertilizer gave a fruit yield of 29 tons/acre; the other soil, with an exchangeable K_2O content of 110 lb./acre, yielded 42 tons/acre on the addition of 200 lb./acre of K. [See also *H.A.*, 35: 5917.]

8047. Škol'nik, M. Ja., and Davydova, V. N.
The influence of zinc and vitamins B_1 and B_6 on the incorporation of C^{14}-tyrosine into proteins. [Russian.] *Doklady Akad. Nauk SSSR*, 1965, **161**: 1465-6, bibl. 11.

Trials are reported in which tomato seedlings were grown in culture solutions with and without Zn and vitamins B_1 and B_6. When deficiency symptoms began to appear on plants deprived of Zn, all plants were treated with C^{14}-labelled tyrosine by adding it to the nutrient solution. The specific activity of the proteins in leaves, stems and roots was lower in Zn-deficient plants than in plants receiving Zn or vitamins, but this reduction in protein synthesis was not accompanied by a reduction in the accumulation of radioactive tyrosine. The reduction in the protein-N content of the plants due to Zn deficiency was not so great when the vitamins were added to the nutrient solution. [See also *H.A.*, 33: 1043.]

8048. Gausman, H. W., and others.
Chloride affects internal structure of plants. *Me Fm Res.*, 1965, **13**(1): 35-7.

Tomato plants of the variety Fireball, in sand culture, received 400 p.p.m. of chloride twice weekly after reaching a height of about 2 inches. Microscopic studies showed that the primary vessels in the stems of treated plants were smaller and more numerous than those of chloride-free plants. Chloride-treated plants were larger and flowered earlier.

8049. Bojko, L. A.
Uptake of salt ions by tomato roots in connection with the inhibition of various stages of aerobic respiration. [Russian, with English summary 13 lines.] *Fiziol. Rast.*, 1965, **12**: 45-51, bibl. 24.

Plants were raised in water culture, in Knop's solution and in Knop's solution with the chloride concentration increased to 0·03%. Oxygen was supplied to the roots by the daily addition of H_2O_2 solution. When the plants were forming flower buds they were treated for 24 hours with various respiration inhibitors and the uptake of PO_4, NO_3, Cl and Ca ions measured. DNP (2×10^{-4}M) completely inhibited the uptake of the 3 anions, but only partially inhibited Ca ion uptake. Medinal (10^{-2}M) reduced the uptake of PO_4 and NO_3 ions but enhanced the uptake of Cl and Ca ions. Sodium diethyldithiocarbamate (5×10^{-2}M) reduced the uptake of Ca ions, enhanced the uptake of Cl ions and had little effect on the uptake of NO_3 and PO_4 ions. The inhibitors had similar effects in both the salinized solution and in ordinary Knop's solution.

8050. (Lunin, J., and Gallatin, M. H.).
Where there's too much salt . . . *Agric. Res., Wash.*, 1965, **13**(11): 5, illus.

Tomato root systems were divided into top, middle and bottom zones, and irrigated with different combinations of fresh water and synthetic sea water. The water uptake of the saline-free zone increased when the rest of the root system was exposed to a high concentration of salts. When only one zone was salinized the water uptake was only slightly less than that of plants in salt-free soil, but when 2 zones were salinized the uptake was considerably reduced.

Tomatoes—weed control and irrigation.

(*See also* 7647.)

8051. Colby, S. R., Wojtaszek, T., and Warren, G. F.
Combining herbicides for tomatoes and strawberries. From abstr. in *Agric. Sci. Dig., Purdue Univ.*, Mar.-Apr. 1965, **7**: 1, being *J. Article* **2336**.

The addition of 0·5 lb. paraquat to either 2 or 4 lb. solan/acre controlled crabgrass in tomatoes more effectively than doubling the rate of solan. Velvetleaf was resistant to DCPA and sesone when applied separately pre-emergence to strawberry beds, but it was susceptible to a combination of the 2 herbicides. [For earlier work see *H.A.*, 35: 2452.]

8052. Krihning, J.
Untersuchungen über die Einwirkung herbizider Substanzen auf physiologische Vorgänge in Kulturpflanzen. III. Die Atmung und die CO_2-Assimilation des Blattgewebes von *Lycopersicon esculentum* Mill. **(Investigations on the effect of herbicides on physiological processes in cultivated plants. III. Respiration and CO_2 assimilation in tomato leaf tissue.)** [English summary ½ p.] *Phytopath. Z.*, 1965, **53**: 65-84, bibl. 55.

The results of metabolic investigations on tomatoes suggested a close relationship between disturbance of the water relations and alterations of the metabolic processes. It was demonstrated that Na-TCA inhibited both respiration and photosynthesis. Solutions of 2,4-D-Na at higher concentrations caused alterations of the entire metabolism of the plants. W6658 (2-chloro-4,6-bis(ethylamino-s-triazine)) only affected photosynthesis. In trials with new herbicides, E_{19} (N,N'-bis(trichloroacetyl)-hydrazine) inhibited respiration but not photosynthesis, and E_{52} (thiocarbethoxythioglycolic acid dimethylamide), E_{34} (methyl form of E_{52}) and CH (dimethylamide of chloroacetic acid) blocked respiration and reduced photosynthesis in varying degrees. [From author's summary. For part II see *H.A.*, 35: 5910.]—Martin-Luther-Univ., Halle-Wittenberg.

8053. Dimitrov, G.
Irrigation of a late tomato crop. [Bulgarian, with English and Russian summaries 1 p. each.] *Grad. lozar. Nauka*, 1965, **2**: 193-203, bibl. 10.

In 3 years' trials 3 soil moisture levels, viz. 65%, 75% and 85% of field capacity, were tested at 2 stages of growth, viz. from planting to the beginning of ripening and from the onset of ripening to the end of harvesting. The highest yields were obtained when the pre-irrigation moisture level of 85% or above was maintained throughout the growing period. The lowest yields were obtained from the unirrigated plots. Irrigation requirements to maintain various moisture levels under the conditions of the experiment are given.—"Marica" Veg. Crop Inst., Plovdiv.

8054. Till, M. R.
Research finds an answer to irrigation in glasshouse tomato crops. *J. Agric. S. Aust.*, 1965, **68**: 234-6, illus.

Trials are reported which showed that the first irrigation after planting might be delayed for up to 3 months without significantly affecting yields. Irrigating 4 times between 12 July and 2 October gave higher yields and larger fruits than irrigating twice in the same period.

8055. Galvin, J.
Influence of soil moisture regimes and peat mulch on tomato growth in a glasshouse. *Irish J. agric. Res.*, 1965, **4**: 19-24, bibl. 13.

Tomato plants were grown in lysimeters under glass with different soil moisture regimes combined with a mulch of peat moss. The highest total yield of fruit was obtained with the wettest moisture regime (near field capacity). Although there was a gradual decrease in yield with increasing moisture tension, the decrease was most pronounced at tensions of 30 cm. mercury and higher in 1961, and at tensions of 40 cm. mercury and higher in 1962. When the soil moisture was maintained at a tension higher than that at field capacity the percentage of small fruit (<50 mm. diam.) increased and the percentage of large fruit (>50 mm. diam.) decreased. Below a tension of 30 cm. mercury, however, this influence was not pronounced. Although peat mulch did not significantly increase yields, it showed a tendency to do so in 1961. Fruit from all treatments was uniformly red and free from disorders. [From author's abstract.]—An Foras Talúntais, Kinsealy, Co. Dublin.

8056. Lingle, J. C., and others.
Frequent irrigation detrimental for mechanically-harvested tomatoes. *Calif. Agric.*, 1965, **19**(5): 6-7.

Tomatoes, growing on loamy soils, were subjected to 6 irrigation regimes. With increasing amounts of water, the percentage of ripe fruit and the mechanically harvestable yield decreased, although the potential yield rose. The drier irrigation treatments produced the highest yield of total edible solids per acre. One or more irrigations during the 6 weeks prior to harvest reduced both the percentage and the yield per acre of edible solids.

Tomatoes—physiology and composition.

8057. Pervova, Ju. A.
Effect of some physiologically active substances on the character of tissue formation in axial organs of pumpkin and tomato plants. [Russian, with English summary 11 lines.] *Fiziol. Rast.*, 1965, **12**: 126-33, bibl. 19.

Young plants of tomato and pumpkin were treated with aqueous solutions of gibberellic acid and triiodobenzoic acid. Anatomical studies were made on 20-day-old tomato plants and 18-day-old pumpkin plants. The anatomical responses of the roots and shoots were basically similar. Both GA and TIBA stimulated cell division of the cambium. The size of the cambial cells was increased by GA and reduced by TIBA. TIBA produced considerable changes in the structure of the fibro-vascular tissue, with a reduction in the size of conducting and mechanical elements and an increase in the number of the latter, particularly in pumpkin roots. The action of TIBA was reduced or even eliminated when applied in conjunction with GA. GA caused a reduction in the size and number of starch grains in the parenchyma.

8058. Evans, J. J., and Alldridge, N. A.
The distribution of peroxidases in extreme dwarf and normal tomato (*Lycoperiscon esculentum* Mill.). *Phytochemistry*, 1965, **4**: 499-503, bibl. 18.

Studies of the peroxidases in various parts of dwarf and normal tomato plants showed that the peroxidase activities of the pith, cortex and leaf of the dwarf are about 3 times greater than those of respective normal tissues. The dwarf and normal roots, however, have essentially the same peroxidase activity. In both the dwarf and normal plants the peroxidase activity is lowest in the leaf tissue. No qualitative electrophoretic differences between dwarf and normal peroxidases were found. [From authors' abstract.]—W. Reserve Univ., Cleveland, Ohio.

8059. Trippi, V. S., Pina, J. C., and Boninsegna, A. J.
Studies on ontogeny and senility in plants. VIII. Amylase activity, capacity for IAA destruction, nitrogen level and antibiotic power of tomato plant tissues in different stages of ontogeny. *Phyton, Argentina*, 1965, **22**: 27-33, bibl. 36, illus.

Ageing brings about an increase in amylase activity and a decrease in tissue hydration, in IAA-destroying capacity and in the contents of soluble N and antibiotic substances. Vegetative propagation induces partial rejuvenation as measured by amylase activity. Leaf shape and flowering suggest that plants obtained from apical cuttings are ontogenetically more evolved than those from basal cuttings and that plants from both types of cutting are more evolved than those obtained from seed. The results are discussed in the light of clonal ageing. [From authors' abstract. For part VII see *H.A.*, 35: 3693.]—Univ. Cuyo, Mendoza.

8060. Tarnowska, K.
Badania nad wpływem niektórych czynników na tworzenie się karotenu w liściach pomidorów. **(Investigations on the influence of certain factors on carotene formation in tomato leaves.)** [English and Russian summaries ¾ p. each.] *Roczn. Nauk rol., Ser. A*, 1964, **89**: 645-55, bibl. 18.

Studies in Bulgaria have shown that the carotene content in the leaves of glasshouse tomatoes was highest just before fruit ripening. Young leaves contained more carotenes than older leaves, and the lamina more than the petiole or stem. The leaves of plants grown for 5–7 days under drought conditions were richer in carotenes than those of irrigated controls. Removing the growing points, or their enclosure in dark bags, reduced the carotene content of the leaves, whereas removing the inflorescences had no effect. [See also *H.A.*, 35: 3728.]

8061. RAMSEY, J. C.
Radiotracer studies of carbohydrate catabolism in tomato fruit. *Diss. Abstr.*, 1964, **25**: 3230, being *Order No.* 64-13,374 of 43 pp.

Using glucose-C^{14} substrates.

8062. SCHORMÜLLER, J., AND GROSCH, W.
Aromatic constituents of foods. II. Occurrence of additional carbonyl compounds in tomatoes. III. Analysis of volatile alcohols of tomatoes. [German?] *Z. LebensmittUntersuch.*, 1965, **126**: 38-49, bibl. 17, and 188-93, from abstrs in *J. Sci. Food Agric.*, 1965, **16**: i-316 and ii-40.

Part II: An earlier investigation [*H.A.*, 33: 7447] was repeated on a larger scale. The following additional compounds were detected: glyoxal, methylglyoxal, cinnamaldehyde and hydrocinnamaldehyde. The following compounds were found to have been formed in the distillation residue after storage at −18°: butan-2-one, pentan-2-one, methylheptenone, biacetyl and a C_6-dicarbonyl compound. *Part III*: The presence of methanol, ethanol, n-butano-isobutanol, n-pentanol, isopentanol, 2-methylbutanol and [?n-] hexanol was demonstrated.

Tomatoes—disorders, diseases and pests.

(*See also* 8043.)

8063. MINEV, K.
Malformation of the tomato variety No. 10 × Bizon under glasshouse conditions. [Macedonian, with English summary ¼ p.] *Annu. Fac. Agric. Sylvic., Skopje, Agric., 1962-63*, 1963, **16**: 543-51, bibl. 10, illus.

Leaf epinasty and interveinal chlorosis, twisted shoot growth, and elongation and irregular branching of the peduncles are attributed to fluctuations in the temperature (4–33° C.) and humidity (40–85% R.H.) and to faulty irrigation and nutrition.

8064. WOODS, M. J.
Colour disorders of ripening tomatoes. 6. Occurrence in early tomato crops. *Irish J. agric. Res.*, 1965, **4**: 25-35, bibl. 15.

Green-back increased with increasing temperature (60°–70° F.) in 3 years out of 4. There was no consistent effect of temperature on green blotch, and yellow blotch was unaffected. Ware Cross showed a greater tendency than Ailsa Craig to produce non-uniformly coloured fruit at lower temperatures, but less tendency at higher temperatures. Green blotch occurred less in Ailsa Craig than in Ware Cross. Sowing earlier (22 November) than normal practice (22 December) did not affect the colour ripening disorders. Green-back and green blotch were most prevalent during June and the first half of July. Increases in colour disorders were associated with periods of heavy yield. Supplementary illumination of seedlings had no effect on the colour ripening disorders. Growing the plants in 9-in. containers gave fewer non-uniformly coloured fruit at the 3 temperatures in 1961 and at the 2 lower temperatures only in 1962, but had no beneficial effect on fruit ripening in 1963 and 1964. The effect of containers in reducing blotch was marked on plants grown in fresh soil in the first 2 years. [From author's abstract. [For part 5 see *H.A.*, 35: 3689.]—An Foras Talúntais, Kinsealy, Co. Dublin.

8065. WIERSUM, L. K.
Invloed van groei en verdamping der vruchten op het optreden van neusrot bij tomaten. **(The effect of fruit growth and transpiration on the occurrence of blossom-end rot in tomatoes.)** [English summary ½ p.] *Meded. Dir. Tuinb.*, 1965, **28**: 264-7, bibl. 12.

Five treatments (combining forced or retarded growth and reduced transpiration of the fruit) which favoured the development of blossom-end rot were applied to pot-grown plants stopped at the 6th truss. Forced growth was obtained by removing 5 of the trusses, growth was retarded by removing ⅔ of the foliage, and fruit transpiration was reduced by enclosing them in plastic bags. Forced growth plus reduced transpiration resulted in increased incidence of rot and a rise in the K : Ca ratio in the fruit. The Ca content was increased and the K : Ca ratio lowered by a check to growth. The system of transport of Ca within the plant and its relation to water supply are discussed.—Inst. Bodemvrucht., Groningen.

8066. HAYSLIP, N. C., AND ILEY, J. R.
N-K ratio may influence tomato graywall. *Bett. Crops*, 1965, **49**(2): 28-9, illus.

NPK factorial trials are reported on Homestead-24 tomato plants mulched with black plastic. The incidence of graywall was highest on high N–low K plots and lowest on low N–high K plots. When the fertilizer rate was increased 4-fold with a constant ratio, the percentage of graywall remained approximately the same. Foliar applications of N, P and K did not affect the incidence of the disorder.

8067. GRAINGER, J.
Health in the greenhouse. Reprint from *J. roy. Caledonian hort. Soc.*, 1964, pp. 13-32, illus.

Plant health is discussed in relation to the nematode *Heterodera rostochiensis*, the incidence of tobacco mosaic virus on tomatoes, temperature, R.H. and soil conditions in the greenhouse, methods of growing healthy tomatoes and the use of DD against the root-knot nematode (*Meloidogyne javanica*).

8068. MOORE, L. W., AND GUTHRIE, J. W.
Length and infectivity of potato virus X as influenced by different air temperatures. From abstr. in *Phytopathology*, 1964, **54**: 901.

Crude juice of Bonny Best tomato and tobacco plants infected with potato virus X, when grown at 20° C., induced 2–3 times the number of lesions as juice from the same hosts grown at 40°. This change in lesion count occurred within 4 hours after the plants had been placed in a 40° environment. The PVX particles from plants grown at 40° were 2–5 times longer than those at 20°.—Univ. Idaho, Moscow.

8069. JAEGER, S.
Milchspritzungen zur Einschränkung von Virusinfektionen im Gemüsebau. **(Milk-spraying to restrict virus infections in vegetable growing.)** [English, French and Spanish summaries ⅓ p. each.] *Mitt. Klosterneuburg, Ser. B*, 1965, **15B**: 126-32, bibl. 11.

The spread of tobacco mosaic virus and potato virus X from individual tomato seedlings in the greenhouse was almost completely controlled by spraying with fresh skimmed milk before each cultural operation. Continuing the spraying in the open helped to delay infection by TMV by several weeks. Tests on several vegetables and tobacco showed that milk was effective against, in descending order, cucumber mosaic virus, PVX, TMV and cucumber green mottle mosaic virus. It is recommended instead of trisodium phosphate for disinfecting knives.—Bundesanst. Land- u. Forstwirtschaft, Fischerich.

8070. Shalla, T. A.
Intracellular labeling of TMV antigen with ferritin-antibody conjugate. From abstr. in *Phytopathology*, 1964, **54**: 907.

The technique, using TMV-inoculated tomato leaves, is described. In sections of leaves treated with conjugated TMV antiserum, there was a progressive increase in intracellular binding of ferritin between 5 and 12 days after inoculation. This corresponded to an exponential increase in virus content as determined by infectivity measurements. The amount of ferritin observed in similar populations of cells treated with normal serum conjugate remained constant. This specific labelling (indicating the presence of TMV protein) was principally localized in the ground cytoplasm.—Univ. Calif., Davis.

8071. Rast, A. T. B.
A yellow ringspot strain of tobacco mosaic virus (TMV) from tomato. *Neth. J. Plant Path.*, 1965, **71**: 91-3, bibl. 8, illus.

Including symptoms on inoculated tomato and tobacco plants.

8072. López García, J.
Effect of temperature and zinc on development of tobacco-mosaic virus in resistant and susceptible tomatoes. [Spanish summary 1 p.] *J. Agric. Univ. P.R.*, 1965, **49**: 112-32, bibl. 42.

The varieties Hawaii 6832, OSU-8, OSU-435-4 and California 62 PM 22 were used. Two greenhouse experiments were conducted, each including the 4 varieties and 2 temperatures. Zn foliar sprays were applied to the plants 10 days before inoculation with TMV. Virus concentrations were determined by counting local lesions on Necrotic Turk tobacco leaves caused by inoculum from the tomato plants. The Zn treatments resulted in higher virus concentrations; temperature increases also tended to raise virus concentrations but the differences were not significant. The fresh weights of the plants were greater at lower temperatures, but Zn had no statistically significant effect on fresh weight. Under the experimental conditions Hawaii 6832 and OSU-8 were highly resistant, California 62 PM 22 heterozygous for resistance and OSU-435-4 highly susceptible.

8073. Djordjevic, B.
Effect of 5-fluorodeoxyuridine on the replication of tobacco mosaic virus in meristematic tissue. *Nature*, 1965, **207**: 327, bibl. 9.

Young tomato plants were grown in culture solution to which had been added EDTA at $6 \cdot 4 \times 10^{-4}$M or FUDR at $7 \cdot 6 \times 10^{-6}$M, and after 18 hours were inoculated with TMV. One week later, bioassay on *Nicotiana glutinosa* plants revealed the presence of TMV particles in the root tips. No particles were isolated from the root tips of infected plants grown in pure culture solution.—Biol. Inst., Belgrade.

8074. Smith, P. R., Stubbs, L. L., and Sutherland, J. L.
Internal browning of tomato fruit induced by a late infection of tobacco mosaic virus. *Aust. J. exp. Agric. Anim. Husb.*, 1965, **5**(16): 75-9, bibl. 13, illus.

Inoculation of field-grown tomato plants with a tomato strain of TMV when the first fruit commenced to ripen induced internal browning in 7·4% of the 4,049 fruits produced, and 79% of the plants produced some affected fruit. The production of affected fruit rose to a maximum 42 days after inoculation and declined rapidly to an insignificant level after 73 days. Internal browning did not develop on any of the 3,987 fruit produced by the uninoculated control planting. [Authors' summary.]—Dep. Agric., Burnley, and Scoresby hort. Res. Stat., Vict.

8075. Yassin, A. M., and Nour, M. A.
A new virus disease of tomato from the Sudan. *Plant Dis. Reptr*, 1965, **49**: 599.

Symptoms of a disease named tomato condensed top virus are described briefly. It was transmissible only by grafting.

8076. Strider, D. L., and Konsler, T. R.
Cotyledonary symptoms of bacterial canker of tomato. *Plant Dis. Reptr*, 1965, **49**: 634-5, bibl 5, illus.

Symptoms appeared 6 days after cotyledons of 5-day-old Manalucie tomato seedlings had been sprayed with an aqueous suspension of *Corynebacterium michiganense*. —Univ. N.C., Raleigh.

8077. Hussin, H., and Deep, I. W.
Effect of mineral nutrition on development of crown gall on Bonny Best tomato and Mazzard cherry. *Phytopathology*, 1965, **55**: 575-8, bibl. 12.

A full account of work abstracted in *H.A.*, 32: 6765.

8078. Morton, D. J.
Serological techniques for identifying bacterial spot of tomato. From abstr. in *Phytopathology*, 1965, **55**: 500-1.

Serological techniques for the identification of *Xanthomonas vesicatoria* in tomato leaves (similar to those previously used with capsicum) are described.

8079. Dukes, P. D., and others.
The identification and persistence of an indigenous race of *Pseudomonas solanacearum* in a soil in Georgia. *Plant Dis. Reptr*, 1965, **49**: 586-90, bibl. 14, illus.

An indigenous strain of *Pseudomonas solanacearum* from a soil recently cleared of timber and brush was identified as Race 3. This soil-borne pathogen was highly virulent to tomato, but only slightly virulent to flue-cured tobacco in field and greenhouse studies. Disease reactions of eggplants and peppers are also given. [From authors' abstract.]—Ga Coastal Plain Exp. Stat., Tifton.

8080. Lindsey, D.
Effect of certain fungi on the growth of dwarf tomatoes in gnotobiotic conditions. Abstr. in *Phytopathology*, 1964, **54**: 899.

Dwarf tomatoes were grown in flexible film isolators in the following gnotobiotic conditions: germ-free, germ-free reinfested with *Trichoderma*, germ-free reinfested with *Chaetomium*, germ-free reinfested with *Fusarium roseum* and germ-free reinfested with *Rhizopus nigricans*. Plants were reinfested after being germinated and transplanted aseptically. In each isolator, plants were grown with modified Hoagland's solution in a sand-perlite mixture, light being supplied by fluorescent tubes at 1,200 to 1,800 f.-c. at plant level. Day temperatures of 26° C. and night temperatures of 21° were maintained. After 42 days the plants were harvested. Plants grown in *Trichoderma*- and *Chaetomium*-infested environments were significantly taller than germ-free plants but had similar dry weights. The plants in *Fusarium*- and *Rhizopus*-infested environments had a significantly greater dry weight per plant than germ-free plants. Growth-regulating effects produced by the fungi are suggested by these data.—Colo. St. Univ., Fort Collins.

8081. Daebeler, F., and Kirchner, H.-A.
Beobachtungen zum Auftreten der *Didymella*-Fruchtfäule bei Tomaten. **(Observations on the occurrence of *Didymella* fruit rot in tomatoes.)** *NachrBl. dtsch. PflSchDienst, Berlin*, 1965, **19**: 16-17, bibl. 3, illus.

The usual symptoms of the disease appeared on the fruit in the variety Vollendung, but in the varieties Hellfrucht, Moneymaker and Hellperle the lesions were non-typical. Leaf infection by this fungus is apparently uncommon, but was observed on a small scale in 1960.

8082. Jones, J. P., and Littrell, R. H.
Another appearance in Florida of a wilt *Fusarium* pathogenic to race 1-resistant tomato varieties. *Plant Dis. Reptr*, 1965, **49**: 536-7, bibl. 2.

A biotype of *Fusarium oxysporum* f. *lycopersici* was discovered at places in Florida. It was pathogenic to Manalucie, Manapal, Homestead 24, Rutgers and STEP 322. and non-pathogenic to the Florida Agricultural Experiment Station breeding line 742-R1-3-Bk. [From authors' abstract.]—Gulf Coast Exp. Stat., Bradenton, Fla.

8083. Corbett, D. C. M.
Late blight control on tomatoes in Malawi. *Rhod. J. agric. Res.*, 1965, **3**: 33-8, bibl. 5.

Spraying experiments to control late blight (*Phytophthora infestans*) were carried out over 3 wet seasons. The best fungicides were found to be bordeaux mixture (8 lb./100 gal./acre), zineb (2 lb./100 gal./acre) and cuprous oxide (4 lb./100 gal./acre) and the best method of timing applications was after every 2 in. of cumulative rainfall. Bordeaux mixture after every 2 in. of cumulative rainfall gave the best economic return. A dry season spraying trial using 5 different fungicides applied weekly, fortnightly and three-weekly, starting 6 weeks after planting, showed that only weekly applications gave a significantly higher yield. There were no significant differences between fungicides. [From author's summary.]—Minist. nat. Resources, Zomba.

8084. Obrero, F. C., and Aragaki, M.
Some factors influencing infection and disease development of *Phytophthora parasitica* Dast. on tomato. *Plant Dis. Reptr*, 1965, **49**: 327-31, bibl. 12, illus.

Eight tomato varieties were tested for susceptibility to 9 isolates of *P. parasitica*. N-64, a hybrid between STEP 390 and HES 6578, showed most resistance to all the isolates. Tomato isolates were more pathogenic to tomato fruit than isolates from pineapple, parsley, hibiscus, carnation, eggplant and soil. An isolate from papaw was not pathogenic. Fully developed green fruit and ripe fruit rotted rapidly, whereas fruit turning pink at the time of inoculation was resistant to infection. —Hawaii agric. Exp. Stat., Honolulu.

8085. Mészöly, G., Hódosy, S., and Szürke, J.
Cladosporium ellenálló paradicsomfajták nemesítésének és összehasonlító vizsgálatának hazai eredményei. **(Results obtained in Hungary in the breeding and comparative investigation of tomato varieties resistant to leaf mould.)** [English and Russian summaries 1 p. each.] *Növénytermelés*, 1965, **14**: 21-44, bibl. 34, illus.

The distribution of *Cladosporium fulvum*, its economic importance, biology and control, and breeding tomatoes abroad and in Hungary for resistance to leaf mould are reviewed. Simple and complex specific hybrids were produced using *Lycopersicon esculentum*, *L. peruvianum*, *L. hirsutum* and *L. pimpinellifolium*. After several generations 4 resistant and productive forms were selected. In glasshouse variety trials with 54 varieties of foreign tomatoes Floralow (U.S.A.) proved to be the most valuable. Antimold B produced very low yields, and some well-known varieties, including Homestead and Moneymaker, were susceptible and gave below-average yields. [See also *H.A.*, 35: 5877.]

8086. Sugahara, Y., and others.
Studies on breeding tomatoes for leaf mould resistance. II. Characters of new tomato selections highly resistant to leaf mould and the breeding procedure. [Japanese, with English summary 1 p.] *Bull. hort. Res. Stat. Shizuoka, Ser. B* (*Okitsu*), 1965, No. 4, pp. 17-36, bibl. 13, illus.

The selections Okitsu Nos 7 and 8 are both resistant to *Cladosporium fulvum*, produce comparatively large, regularly shaped pink fruits of medium to late maturity, and are adaptable for winter or spring cultivation under glass. Both strains grow more vigorously than the variety Fâsto.

8087. Silveira, A. P., Cruz, B. P. B., and Figueiredo, M. B.
Occorrência de oidio em tomateiros no estado de São Paulo. **(The presence of *Oidium* sp. on tomato plants in São Paulo state.)** *Biológico*, 1965, **31**: 63-5, bibl. 6, illus.

Recommended control measures are included.

8088. Mas, P., Beyries, A., and Messiaen, C.-M.
Mise en évidence d'une interaction entre précocité et sensibilité au *Verticillium* chez la tomate. **(The demonstration of an interaction between earliness and susceptibility to *Verticillium* in tomatoes.)** [French and English summaries ½ p. each.] *Phytopath. medit.*, 1965, **4**: 25-30, bibl. 3.

Fruit yields from the wilt-susceptible tomato variety St Pierre were much higher than those from Marmande, in which susceptibility was apparently greater because of the early fruiting, and were equal to those from the wilt-resistant Marmande VR. Removing the first 1 or 2 trusses increased yields in the susceptible Marmande but reduced yields in Marmande VR. The results of tomato variety trials for wilt resistance will be valid only if fruiting is synchronized, since susceptibility remains latent until fruit ripening begins.—Stat. Path. vég., Montfavet.

8089. HELTON, A. W.
Chemotherapeutic action of dimethoate against a root-knot nematode in greenhouse tomato plants. *Plant Dis. Reptr*, 1965, **49**: 352-6, bibl. 5, illus.
When tomatoes were sprayed with dimethoate at rates from 50 to 1,800 p.p.m. either before or after inoculation with *Meloidogyne hapla*, good control of the nematode was obtained at and above 300 p.p.m. When applied before infestation, 50 p.p.m. successfully suppressed gall formation. The best root systems developed on plants sprayed at 300 p.p.m.; some plant injury resulted from spraying at the highest rates but post-infestation treatments were least injurious. Soil drenches at 60 ml. per plant were also effective. When cucumber seeds were planted together with portions of roots from treated and untreated tomatoes, least galling and the best cucumber root systems developed where the tomatoes had been treated at 800 p.p.m. after infestation. Damping-off of cucumbers due to *Fusarium* spp. was also reduced where the tomato roots had been treated at 200 and 800 p.p.m.

8090. GOULD, G. E.
Fruit fly control on newly picked tomatoes. From abstr. in *Agric. Sci. Dig., Purdue Univ.*, Jan.-Feb. 1965, **7**: 2, being *J. Pap.* **2389**.
Dichlorvos applied as a 1% dust or as 2% granules was slightly more effective than a 1 : 1 pyrethrin-piperonyl butoxide mixture for preventing damage by *Drosophila* sp. A repellent formulation, 6258, also gave promising results. Aldrin sprays applied 6–10 times did not completely prevent egg-laying on the fruit. Aldrin baits were superior to Guthion in reducing the number of eggs laid. Diazinon at 8 oz./acre in spray and granule form applied by aircraft gave better protection than the aldrin spray.

8091. SARAIVA, A. C.
As lagartas polífagas—*Heliothis armigera* (Hübner) e *H. peltigera* Schiff.)—no arquipélago de Cabo Verde. **(The polyphagous caterpillars, *Heliothis armigera* and *H. peltigera*, on the Cape Verde archipelago.)** [French summary 15 lines.] *Garcia de Orta*, 1963, **11**: 593-9, bibl. 12, [received 1965].
Control measures recommended for tomato crops include cultivating the soil immediately after harvesting (except in dry areas liable to erosion), frequent hand picking and destruction of the caterpillars, especially when the fruits begin to form, and the application of DDT in cases of severe attack.

8092. (GELLATLEY, J. G.)
Carbaryl affects tomato plants. *Agric. Gaz. N.S.W.*, 1965, **76**: 178.
Of several insecticides tested DDT and carbaryl gave complete control of a heavy infestation of *Heliothis* caterpillars. However, carbaryl reduced plant vigour leading to smaller fruits and much leaf-edge yellowing.

Tomatoes—fruit harvesting, storage and marketing.

8093. SIMS, W. L., ZOBEL, M. P., AND KING, R. C.
Growing tomatoes for mechanical harvesting. *Publ. Univ. Calif. agric. Ext. Serv.* **AXT-150**, 1964, pp. 8.
Advice on planting, varieties, culture and weed control.

8094. GOULD, W. A., AND OTHERS.
Automated tomato harvesting. *Ohio Rep. Res. Dev.*, 1965, **50**: 27-8, illus.
Trials are briefly reported of a single self-propelled unit containing pick-up, sorting and discharge equipment. Under ideal conditions yields of 15 tons per hour were obtained. Various containers tested for use with harvesters include a steel tank holding 400 lb. of fruit and 20 gal. of water, and smaller plastic and wooden bins. The use of chemicals in the container water or as a dip reduced bacterial spore levels without causing spoilage. There was little difference in the drained weight of processed tomatoes from different types of handling system when the holding period was short, but with periods exceeding 24 hours a greater loss in drained weight occurred from tomatoes handled in water tanks than from those given dips or held in a dry condition.

8095. (AYRES, J. C., AND OTHERS.)
Seek ways to lengthen tomato storage life. *Iowa Fm Sci.*, 1965, **19**(12): 14.
Mature, green tomatoes stored in an atmosphere of 5, 7½, 10 or 20% ethylene oxide quickly discoloured. At lower levels of the gas (1 and 2%) they spoiled within 2 weeks. Field spraying with potassium sorbate, kinetin or water just before harvest failed to prolong storage life, although weekly applications produced some improvement. Tomatoes kept for several weeks when the stem scars were painted with Tackiwax, Lepack or a mixture of paraffin and mineral oil. [See also *H.A.*, 35: 3730.]

8096. MANLEY, W. T., AND GODWIN, M. R.
Marketing Florida vine-ripened tomatoes. *Circ. Fla agric. Exp. Stats* **S-147**, 1963, pp. 23, [received 1965].
A survey of marketing practices including storage, transport, grading and packing.

8097. BOHALL, R. W., FARRISH, R. O. P., AND PODANY, J. C.
Packing mature green tomatoes: costs, efficiencies, and economies of scale in the Lower Rio Grande Valley of Texas. *Mktg Res. Rep. U.S. Dep. Agric.* **679**, 1964, pp. 45, bibl. 3.
See also *H.A.*, 35: 1291.

Sundry crops.

8098. TERRA, G. J. A.
The significance of leaf vegetables, especially of cassava, in tropical nutrition. *Trop. geogr. Med.*, 1964, **2**: 97-108, bibl. 37, being *Publ. roy. trop. Inst., Amsterdam*, **283**, 1964[?], pp. 12.
The protein contents of leaves suitable for human consumption from 50 species of tropical herbs, shrubs and trees are also given.

8099. PATNAIK, B. P.
Potato bean needs a better deal. *Indian Hort.*, 1964, **9**(1): 13.
Land preparation, planting, culture, pruning and harvesting are described for *Pachyrhizus angulatus*. Preliminary studies showed that the tuber contained 6·9% starch at maturity and had a 2·4% glucose content from the second month of formation onwards.—Koraput Range, Jeypore (Orissa).

ORNAMENTAL PLANTS.

General.

8100. SOUTH AUSTRALIA BOTANIC GARDEN, ADELAIDE.
Annual Report of the Board of Governors for the year 1963-64, 1965, pp. 29, illus.

Experimental work, briefly summarized in the *Nursery Section* (pp. 17-20), includes the following: The successful use of a new compost (60% rice hulls, 30% peat and 10% fine sand) for bromeliads and a modification of this (70 : 20 : 10) for re-potted cymbidiums; Nitrophoska Red (15 : 15 : 20) used as a liquid fertilizer for various crops; the unsuccessful grafting of *Clianthus formosus* on *Colutea arborescens*; the use of screened sphagnum moss to cover seed pots and reduce damping-off; short-day treatment of kalanchoe cultivars; and mist propagation of several woody ornamental species.

8101. WASHBURN, R. H.
Alaskan ornamentals and fruits. *Arnoldia,* 1965, **25**: 9-12.

Growing conditions are described, and a list is given of ornamental trees and shrubs, roses, bush fruits and flowers which grow satisfactorily in the different areas of Alaska.—Washburn Fm Nursery, Palmer, Alaska.

8102. WITTSELL, L. E.
Effects of soil compaction on plant growth. *Diss. Abstr.*, 1964, **25**: 3198, being *Order No.* 64-13,242 of 69 pp.

In a series of experiments over 6 years the effects were studied of compacting a silt loam soil by various methods on the growth and yield of several crops and ornamentals, including petunias, snapdragons, chrysanthemums, poinsettias and tomatoes. Petunia blossoming benefited from calcium peroxide fertilizing but was severely reduced by compaction. Very severe compaction delayed tomato fruit ripening for 2 weeks, reduced the yield by 60% and checked early plant growth severely. Banded tomato transplants grew better than unbanded ones. Moderate compaction had little effect on potted poinsettias but slightly reduced the growth of potted chrysanthemums and of benched chrysanthemums and snapdragons. Soil compaction to a density of 1·5 g./c.c. reduced the plant height and dry weight at harvest of the chrysanthemum varieties Cloudburst and Skyline; the number of flowers was reduced in the former and flower size in the latter. Compaction noticeably restricted root development. Compaction increased Na and Ca uptake, reduced P and K uptake and had little effect on the uptake of N and Mg. Stem length, spike length and dry weight at harvest of Broker's Tip snapdragons were reduced by compaction to a density greater than 1·5 g./c.c. Compaction of less than 1·45 g./c.c. had no measurable effects. The CO_2 content of the soil atmosphere rose with time and level of compaction. Only severely compacted soil had a CO_2 concentration approaching toxic levels.—Kans. St. Univ.

8103. OTTO, A.
Methoden zur Steuerung des Blühtermins. **(Methods of controlling the flowering period.)** *Zierpflanzenbau,* 1965, **5**: 387-9, bibl. 1, illus.

A concise account of temperature and photoperiodic control as applied to various common ornamentals.

8104. OTTO, A.
Das Kunstlicht für die Pflanzenanzucht und Blütenförderung. **(Artificial light for plant raising and flower promotion.)** *Zierpflanzenbau,* 1965, **5**: 471-2, illus.

Including tabulated data on the amounts of additional light (Watt/sq. m.), dates of treatment and temperatures suitable for *Aechmea, Begonia, Calceolaria, Chrysanthemum, Euphorbia, Kalanchoe, Saintpaulia, Sinningia* and *Vriesia* spp.

8105. LAVSEN, E. R.
IV. Sektionsforsøg. B. Potteplante-sektionen. **(IV. Sectional experiments. B. Pot plant section.)** *Arbog Gartneri, 1964,* [1965], **46**: 127-30, illus.

Soil watering with Cycocel retarded growth in *Nerium oleander*; Phosfon, applied as a drench or foliar spray, and foliar applications of Cycocel were not effective. Neither Cycocel nor Phosfon affected *Stephanotis floribunda*; B-Nine retarded its growth but had some phytotoxic effects. For *Scindapsus aureus* captan and zineb gave the best control of *Pythium* spp. in trials of fungicides mixed with the potting soil. The growth of *Begonia × cheimantha* was impaired by a high concentration (500 g./sq. m.) of fungicides mixed with the potting soil, and ferbam affected flower colour. Captan, zineb and Folpet at 250 g./sq. m. were not phytotoxic.

8106. SMITH, W. H.
Vase-fresh flowers. *Agriculture, Lond.*, 1965, **72**: 190-3.

A brief discussion of problems associated with the precooling, dry-packing and gas-packing of cut flowers and of factors which affect their keeping quality.—Ditton Lab., Kent.

8107. BELYNSKAJA, E. V.
The water regime and respiration in cut flowers of some ornamental plants. [Russian.] *Bjull. glav. bot. Sada,* 1964, No. 54, pp. 43-50, bibl. 4, illus.

Experiments have shown that premature wilting in cut tulip flowers is associated with a fall in the intensity of respiration [see also *H.A.*, 35: 6107], in sweet pea flowers with a fall and sharp fluctuations in respiration and in dahlia flowers and the flowers of some other species with a disruption of the translocation of water and nutrients to the flowers. The addition of 6% sucrose+0·075% boric acid to the water raised the level of respiration and stabilized it, and prolonged the life of sweet pea flowers by 3–4 days (to a total of 7–8 days). A similar treatment also doubled the life of flowers of lily-of-the-valley and some other plants. In cut dahlias the water content was raised and flower life prolonged to 9–10 days by a solution containing 1·5% sucrose, 0·075% aluminium sulphate, 0·001% ferric sulphate and 0·003% calcium hypochlorite. Lilac and astilbe flowers lasted for 10–14 days in water containing 8% sucrose, 0·003% silver nitrate and 0·01% calcium nitrate.

Propagation and nursery management.

8108. PROBOCSKAI, E.
A magyar duzzasztott perlit, mint zölddugványgyökereztető közeg. **(Hungarian expanded perlite as a rooting medium for soft-wood cuttings.)** [English and Russian summaries 1¼ pp. each.] *Kert. szől. Foisk. Közlem.*, 1964, **28**(1, part 2): 315-28, bibl. 31.

Soft-wood cuttings of chrysanthemum, fuchsia and privet and leaf cuttings of saintpaulia were rooted in perlite, peat, sand, perlite+sand, perlite+peat, peat+sand or perlite+peat+sand. Rooting in perlite was as good as, or better than, in river sand. In comparison with peat the cuttings in perlite produced shorter roots and smaller root systems. The best results were obtained in a 1 : 1 mixture of perlite with peat or sand, followed by a 1 : 1 : 1 mixture of the 3 media. The media did not generally affect the way in which the main roots developed, but lateral root development was affected by the media. The most numerous and longest lateral roots were produced in peat, which is attributed to its nutrient and growth substance contents and satisfactory aeration.

8109. Werminghausen, B.
Kunststoffschaumflocken für die Bodenverbesserung. **(Plastic foam flakes for soil improvement.)** *Schweiz. Gärtnerztg*, 1965, **68**: 165, 167-9, bibl. 6, illus.

The use of Styromull (polystyrol flakes) for ornamentals such as hydrangea cuttings and orchids is described. It improved the soil texture and increased its warming capacity and soil bacteria populations. [For an earlier report see *H.A.*, 34: 7015.]

8110. Wildon, C. E., and O'Rourke, F. L. S.
The effect of arcillite in media for pot plants. *Mich. Flor.*, 1965, No. 412, pp. 25-7, 33, bibl. 3.

The structure and composition of this calcined clay are described. In pot trials 7 species of greenhouse plant, 2 species of ground cover plant and 3 species of woody plant were grown in 3 composts, namely, a loam soil, a 2 : 1 mixture of loam and arcillite and a 2 : 1 mixture of peat and arcillite. All species grew better in mixtures containing arcillite than in soil alone; in most cases peat+arcillite gave the best results. Fuchsias potted in mixtures containing fertilizer-impregnated arcillite made significantly more growth than in other composts including those containing untreated arcillite. [For earlier work see *H.A.*, 34: 3938.]—Mich. St. Univ., E. Lansing.

Weed control and plant protection.

8111. Ministry of Agriculture, London.
Chemical weed control in flower crops. *S.T.L. Minist. Agric., Lond.*, **20**, 1964, pp. 7.

The latest recommendations, covering anemones, annual, biennial and perennial flower crops, bulbs (irises, narcissi, tulips), chrysanthemums, dahlias, gladioli, peonies, roses and rose stocks, shrubs and trees.

8112. Cole, A. W., and Denisen, E. L.
Herbicidal injury studies with horticultural crops. II. *Abstr. 1964 Mtg Weed Soc. Amer.*, pp. 91-2.

An experiment [which had given inconclusive results] was repeated in 1963, using as a central source of vapour cheesecloths saturated with 2,4-D butyl ester solution and placed in position (suspended between wires) on 20 May. Concentric rows of perennial horticultural species which had attained bud-burst (annuals were not planted till later) showed early injury occurring up to 84 ft. in all directions. From mid-July onwards, when 2,4-D contamination of the atmosphere appears to become general in Iowa, injury measured in terms of reduced growth of vine shoots remained discernible up to the 10th row from the centre (17th row = 150 ft.).—Iowa St. Univ., Ames.—*Weed Abstr.*, **14**, No. 88.

8113. Gibson, W. B.
Weed control . . . a pointer to nurserymen. *Agric. N. Ireland*, 1965, **40**: 57-9.

Effects of simazine on 35 herbaceous plants. [See also *H.A.*, 35: 1310.]

8114. Vanderveken, J.
Recherches sur un virus du trèfle blanc, transmis par *Euscelis plebejus* Fall. (Homoptera, Jassidae). **(Studies on a white clover virus transmitted by *Euscelis plebejus*.)** [Flemish, English and German summaries ⅓ p. each.] *Meded. Landb-Hogesch. Gent*, 1964, **29**: 917-25, bibl. 13.

Including the symptoms caused by the virus on *Chrysanthemum carinatum*, *Vinca rosea* and tobacco.

8115. Hellmers, E.
Tørveskimmel (*Ostracoderma epigaeum* (Link) Hennebert) og dens perfekte stadium tørvebægersvamp (*Peziza atrovinosa* Cooke & Gerard). **(Peat mould (*Ostracoderma epigaeum*) and its perfect stage (*Peziza atrovinosa*).)** [English summary ½ p.] *Horticultura*, 1965, **19**: 71-80, bibl. 14, illus.

A fungus that has been observed growing on steam sterilized sphagnum peat moss and on fibre pots has been identified as *Ostracoderma epigaeum* (syn. *Botrytis epigaea*). The fungus has frequently been observed on mushroom beds. In some cases young seedlings of begonia, petunia and gerbera have been "suffocated" by the fungal growth. Steaming destroys the antibiotic effect in the peat, and should therefore be avoided; with certain compost mixtures the soil should be steamed before mixing. Growth of the fungus in gerbera seed-pots has been controlled by spraying the surfaces of the pots and soil with 0·2% Dithane M.45 after sowing. With uncovered seeds a lower rate of application should be used. Control of the fungus on mushroom beds is not yet possible, but conditions that are optimal for mycelial growth of the mushrooms are not favourable to peat mould.—Plantepat. Afd., kon. Vet.- og LandbHøjsk.

8116. Fenili, G. A.
Difesa delle colture floricole. **(Pest control in ornamental plants.)** *Inf. fitopat.*, 1965, **15**: 122-33, illus.

Current methods of controlling nematodes, mites and insect pests of flower crops in general, and of carnations, gladioli, chrysanthemums and roses in particular, are described.

8117. David, S. K.
Phytotoxicity of some systemic pesticides to seeds and plants. *Indian J. agric. Sci.*, 1965, **35**: 57-66, bibl. 4, illus.

Foliar sprays of up to 1% of demeton-methyl and thiometon did not injure rose or croton (*Evanthemum* and *Graptophyllum* spp.) plants; concentrations of up to 1·5% did not damage chrysanthemums. Roses were also unaffected by 0·5% soil drenches of either compound.—Agric. Coll. and Res. Inst., Coimbatore.

Carnations.

(*See also* 7666.)

8118. Altstadt, R. A., and Holley, W. D.
Type of cutting affects initial growth of carnations. *Colo. Flower Grs' Ass. Bull.*, 1965, No. 181, pp. 2-3, illus.

Comparisons of growth were made for cuttings taken from the top and the base of plants and for top cuttings removed at different heights depending on the number of leaf pairs present. Growth was slowest from basal or heel cuttings and from cuttings with only 3 expanded pairs of leaves taken at any position on the plant. Cuttings with 5 expanded pairs of leaves removed from points above 3 or 5 pairs of leaves made the best growth. [See also *H.A.*, 35: 6005.]

8119. PHILLIPS, D. J.
The growth of laterally split carnation shoot tips. *Colo. Flower Grs' Ass. Bull.*, 1965, No. 182, pp. 2-3, bibl. 4, illus.

Shoot tips of plants of 2 varieties were cut down the centre perpendicular to the plane through the base of the youngest visible pair of leaves. Half-tips of each variety were grown in pairs in culture tubes, the 2 cut surfaces being placed together with the split meristems uppermost. The laterally paired tips did not become grafted at the shoot tip but callus formed at the cut base and united the split tips. Eleven out of 29 paired tips survived and produced flowering plants; these were normal in flower shape, colour and plant habit. Flowers of both varieties were produced, but on different plants; in no case did flowers of 2 colours develop from a single plant and no mutation was observed.

8120. PHILLIPS, D. J.
Callus formation of carnation shoot tips grown *in vitro*. From abstr. in *Phytopathology*, 1964, **54**: 903.

Growing pathogen-free plant material from shoot tips has become important in the control of carnation diseases. Abnormal and undesirable callus formation on shoot tips *in vitro* has limited success in producing mature plants. Shoots tips were excised from carnation cuttings, placed in tubes containing Gautheret's modified medium under fluorescent light (200 ft.-c.) and incubated at 65° F. The virus content of shoot tips and of carnation callus from tips was not correlated with the formation of callus. Tips cut to include 250μ of juvenile pith tissue below the first pair of leaf primordia showed a 10 to 90% increase in callus over those without this tissue. There was little callus formation in a medium lacking NAA, but growth was also inhibited. However, when the growth rate of the shoot tip was increased by various means, callus formation in the presence of auxin decreased to ¼ of that in controls. The results suggest an interrelationship between auxin in the medium and the metabolism of the shoot tip which results in organized growth.—Colo. St. Univ., Fort Collins.

8121. PHILLIPS, D. J.
***Fusarium roseum* and the carnation shoot tip.** *Colo. Flower Grs' Ass. Bull.*, 1965, No. 182, pp. 1-2, bibl. 2.

A fresh and disease-free stock was successfully obtained by propagating shoot tips from stock plants infected with *Fusarium roseum*. Plants derived from this stock later showed fewer losses from *F. roseum* infection than did plants derived from normal cuttings taken from healthy stock. [For details of meristem culture see *H.A.*, 34: 7028.]

8122. BJERGGÅRD, A.
Dampning i nellikehuse. **(Soil steaming in the carnation house.)** *Gartner Tidende*, 1965, **81**: 271-3.

Problems of soil steaming to control carnation wilt (*Phialophora cinerescens*) are discussed. Measurements of soil temperature during and for several days after steaming showed that it was difficult to maintain a satisfactory temperature if the soil had not been worked to a sufficient depth, if the steaming pipes were not deep enough and if the soil was wetter than was desirable. The effects of steaming were improved if soil heating was started a few days beforehand.

8123. AILINCĂI, N., PANAIT, T., AND TEŞU, V.
Efectul îngrăşămintelor minerale şi bacteriene asupra culturii de *Dianthus caryophyllus* L. forma Chabaud. **(The effect of mineral and bacterial fertilizers on the culture of *Dianthus caryophyllus* forma Chabaud.)** [French and Russian summaries 5 lines each.] *Lucr. şti. Inst. agron. Iaşi*, 1964, pp. 291-6, bibl. 17.

Of the 12 combinations tested, a mixture of silicobacterium with NPK gave the best results with respect to the number of shoots, the size of root system and the number and size of flowers produced.

8124. GHISLENI, P. L., AND GARIBALDI ACCATI, E.
Ulteriori accertamenti sperimentali sulla concimazione del garofano. **(Further experimental findings on the manuring of carnations.)** *Riv. Ortoflorofruttic. ital.*, 1965, **49**: 213-19, bibl. 13.

Carnations were grown on an old carnation soil and on one new to the crop. Fertilizers were applied at 50%, 75% and 100% of the amounts generally applied locally (Genoa area), the full quota per sq. m. being: 350 g. bone superphosphate at planting; 420 g. bone meal in late June; 100 g. each of dried blood, fish meal and potassium sulphate in late July; 200 g. each of mineral superphosphate, potassium sulphate, bone meal and hoof-and-horn in early August; and 90 g. hoof-and-horn, 100 g. potassium sulphate and 110 g. biammonium phosphate in late November. Flower production was as high with the reduced as with the full fertilizer applications. The increase in the average length of the flower stalks was also the same for the 3 treatments. The diameter of the calyx was not affected by fertilizing. —Univ. Torino.

8125. LEVONEN, H. J.
Bormangel-Symptome bei Edelnelken. **(Boron deficiency symptoms in carnations.)** *Dtsche Gärtnerbörse*, 1965, **65**: 269, illus.

Symptoms of B deficiency observed included: split leaves with axillary shoots growing or curving through the split; splitting and early branching of flower stalks; distorted, spoon-shaped leaves with serrated tips; slow growth of shoots; delayed flowering; and dry, blind flower buds. The uppermost lateral shoots may have a witches' broom appearance. Symptoms occur chiefly in spring and are also associated with excess N. An annual application of 2 g. borax/sq. m. soil surface, while watering, eliminated symptoms without toxic effects.

8126. MEHNERT, T.
Die Wasserversorgung bei Edelnelken. **(The water supply for carnations.)** *Dtsche Gartenb.*, 1965, **12**: 162-3, bibl. 2, illus.

The differences between the irrigation needs of loamy and sandy soils are discussed. A better overall coverage of the soil beds was obtained with a fixed sprinkler rather than with a mobile one. Half the man-hours were needed for the fixed sprinkler as for the mobile one, but both systems used far less time than watering by hose.—V.E.G. Gartenb., Berlin.

8127. Freeman, R. N., and Langhans, R. W.
Influence of day and night temperatures on carnations. *Bull. N.Y. St. Flower Grs*, 1965, No. 232, pp. 1-3, bibl. 15.

In trials over 2 years plants of CSU White Pikes Peak were subjected to 25 temperature treatments (combinations of 5 night and 5 day temperatures ranging between 40° and 80° F.). The total yield was not markedly affected, except that at 40° by day or night the yield was reduced. Flower splitting was influenced by temperature, but the relationship was not clear from the results. The quality of flowers was adversely affected by night temperatures above 65°.

8128. Freeman, R. [N.], and Langhans, R. W.
Response of carnations to photoperiod and temperature. *Bull. N.Y. St. Flower Grs*, 1965, No. 233, pp. 1-3, bibl. 3.

Plants of CSU White Pikes Peak were grown at constant temperatures of 60°, 65°, 70°, 75° or 80° F. from June to September and then at 50°, 55°, 60°, 65° or 70° from September to May. Three photoperiods—18 hours, natural day length and 9 hours—were applied at each temperature. Most flowers were produced at 55°, 60° and 65°; flower quality was highest at 50° and 55° and lowest at 70°. More flowers were produced in 18-hour days than in 9-hour or natural day lengths, but their quality was slightly lower. The percentage of flower splitting was greatest in 18-hour days and least in natural days. The percentage was also lower at 60° than at higher or lower temperatures. Flowering was advanced by higher temperatures and longer days; the longer the day length, the greater the total number of buds visible 57 days after planting. Shoots on plants grown in 18-hour days generally had 3–4 fewer nodes than shoots on 9-hour plants; the temperature apparently did not influence the node number.—Cornell Univ.

8129. Freeman, R. [N.], and Langhans, R. W.
Photoperiod affects carnations. *Bull. N.Y. St. Flower Grs*, 1965, No. 231, pp. 1-3, bibl. 8.

Rooted cuttings of CSU White Pikes Peak were grown from December onwards under natural day length or under 9- or 18-hour photoperiods at 50° F. (night) and 60° (day). Plants grown under an 18-hour photoperiod flowered a month earlier than those grown under shorter days, but their buds took longer to open. Fewer nodes and leaves were produced and plant height increased with increasing day length. The effect of the photoperiod appeared to take place before the buds became visible. In a second study rooted cuttings planted in mid-October were subjected to long (18- and 24-hour) and short (natural and 9-hour) photoperiods and to alternating photoperiods. Plants exposed to 18-hour days for 3–6 weeks after planting before being transferred to 9-hour days behaved as plants given long-day treatment; those exposed to 9-hour days at this early stage responded as if grown in short days throughout.

8130. Sarret, Y.
La lumière artificielle et la culture des oeillets américains. (**Artificial light and the culture of perpetual-flowering carnations.**) *Rev. hort., Paris*, 1965, **137**: 882-3, illus.

Three light intensities were employed (120 W., 80 W. and 60 W. per sq. m., giving 2,700, 1,700 and 1,300 lumens, respectively) to provide an average day length equivalent to that occurring naturally during the summer solstice. CO_2 was supplied throughout. The varieties used were C.C. White 63, Caravelle 63 and New Pettersen Pink 63. They were planted in August, 1963, and picking began in mid-October, 6 weeks earlier than from the control plants. The most strongly illuminated plants produced the most flowers; the flowers themselves were of better quality. There was an absence of secondary shoots. The additional income derived from the use of illumination was almost twice the annual expenditure on light and CO_2.

8131. Holley, W. D., and Eyster, R. G.
June pinching to reduce July-August yield of carnations. *Colo. Flower Grs' Ass. Bull.*, 1965, No. 181, pp. 1-2.

In mid-June 1-year-old plants were either pinched at a high level, pinched about 6 in. lower or left untreated. All stems sufficiently advanced were disbudded. The untreated plants flowered very heavily in July (10 flowers per sq. ft.) and flowering fell to a minimum in September-December. The plants pinched at a high level produced very few flowers from July to mid-August and gave only moderate yields from August to December (about 1 flower per sq. ft.). Plants pinched at the lower level did not start flowering until even later and gave a slightly higher yield in December. From mid-June to mid-April average yields of flowers per sq. ft. were 51·2 for untreated plants, 47·7 for the high-pinched plants and 40·8 for the low-pinched plants.

8132. Nilsson, G. I.
Phialophora wilt of carnation, *Dianthus caryophyllus* L. The behavior of the pathogen, *Phialophora cinerescens* (Wr.) van Beyma, in the host and in soil. *Diss. Abstr.*, 1964, **25**: 3201, being *Order No.* 64-13,785 of 179 pp.

Studies are reported on the morphology, viability with regard to soil moisture and temperature, and rate of growth of *P. cinerescens* in roots, stems and soil. The optimum temperature for disease development was between 18° and 23° C.; above 27° there was negligible disease development. Plants supplied with 150 p.p.m. N showed more severe wilting than those supplied 65 or 10 p.p.m. N. [See also *H.A.*, 34: 7032.]—Cornell Univ.

8133. Halevy, A. H., and Wittwer, S. H.
Prolonging the life of cut flowers by treatment with the growth retardants, B-Nine and CCC. *Mich. Flor.*, 1965, No. 411, pp. 21-3, bibl. 9, illus.
Prolonging cut flower life by treatment with growth retardants B-Nine and CCC. Reprint from *Flor. Rev.*, 1965, **136**(3516): 39-40, bibl. 9, illus.

Carnations and snapdragons were treated with CCC or B-Nine at 10, 50 and 100 p.p.m. in the following ways: (a) the whole flower was dipped into the solution before the stem base was placed in water; (b) the stem base was immersed overnight (18 hours) in the solution and then transferred to water; or (c) the stem base remained in the solution throughout the trial. The atmosphere was maintained at 70° F. and 68–80% R.H. Except for the carnation variety Scania treated with CCC, the dip treatment proved either ineffective or less effective than overnight immersion. Continuous base immersion proved harmful. The most promising results with both compounds were obtained with overnight immersion. The effects on snapdragons were generally greater than those on carnations. Phosfon and N^6 benzyladenine were eliminated at an early stage in these trials as being ineffective or detrimental.—Mich. St. Univ., E. Lansing.

Chrysanthemums.

(*See also* 8102, 8108.)

8134. SALINGER, J. P.
Commercial cultivation of chrysanthemums. *N.Z. J. Agric.*, 1965, **110**: 257-64, illus.

Notes on propagation, soil preparation, fertilization, weed control, irrigation, harvesting, production of pot plants and pest and disease control in New Zealand.

8135. RANA, R. S.
Monosomic interchange heterozygote of diploid *Chrysanthemum*. *Nature*, 1965, **206**: 532-3, bibl. 7, illus.

Discovered among the progeny of a cross between 2 varieties of *C. carinatum*. [See also *H.A.*, 35: 6014.]

8136. ABERNATHIE, J. W., AND BUXTON, J. W.
Hardy chrysanthemum trial results—1964. *Progr. Rep. Ky agric. Exp. Stat.* **147**, 1965, pp. 8.

An evaluation in tabular form of 140 varieties for cut flowers, ornamental value, susceptibility to frost, and general habit of growth.

8137. LOCKHART, C. L., AND SWAIN, G. S.
Storage life of chrysanthemum stool cuttings as influenced by fungicidal treatments, storage temperatures, and stripping. *Canad. J. Plant Sci.*, 1965, **45**: 86-9, bibl. 4, illus.

Chrysanthemum stool cuttings stored from November to May at 28° to 34° F. produced normal flowering plants when planted in the field. Rots seriously affected subsequent growth of stool cuttings stored at 37° but not at 28°–34°. When rots affected the growing tips only, weak lateral growth occurred on the stool cuttings. An Erad (phenyl mercury acetate) field spray before digging or Thylate as a dip or dust treatment after digging did not prevent mould or rot development in storage. Temperatures below 28° injured stool cuttings. [Authors' abstract.]—Canada Dep. Agric, Kentville, N.S.

8138. VLAMIS, J., AND RAABE, R. D.
Sodium injury in chrysanthemum cuttings. From abstr. in *Phytopathology*, 1964, **54**: 911.

Roots of cuttings only slightly injured by sodium were shorter and exhibited red streaks in some vascular tissues. With increased injury the roots became stubby, more deeply coloured and more proliferated, until the most severely affected cuttings produced only a small, brushlike mound of reddish-brown roots. Tests showed that the injury resulted from the build-up of Na ions in the peat fraction of the rooting mixture. Injury began to appear at a level of about 1 ton of actual Na/acre and became severe at about 3 tons/acre. The disorder was controlled by adding gypsum at the rate of 2 tons/acre.—Univ. Calif., Berkeley.

8139. GÖRTZ, H.
Plastic tent—a better start for pot 'mums. *DCK Information*, 1965, No. 7, p. 1, illus.
Unterm Plastik-Zelt ein besserer Start für Topfchrysanthemen. (**A better start for pot chrysanthemums under a plastic tent.**) *Zierpflanzenbau*, 1965, **5**: 515-16, illus.

Clear polythene film fastened over the black-out support wires inside a glasshouse was used to cover newly potted plants of 8 varieties for 14 days in summer and 18–20 days in winter. The temperature could be maintained at 66–73° F. by means of pipe heat under the benches and ventilation at the sides. Growth was 30–60% more vigorous than that of unprotected plants.

8140. ANON.
Influence of fertilization on chrysanthemums. *DCK Information*, 1965, No. 8, pp. 7-8.

Various fertilizer treatments were applied to pot plants of Yellow Delaware and BGA Mermaid in April. Symptoms of deficiency and toxicity for N and K are described for both varieties and suitable rates of fertilizer are suggested. Foliar sprays of $MgSO_4$, $FeSO_4$ and $ZnSO_4$ were also applied every 6 days to some of the plants that received N+K.

8141. VELDEMAN, R.
Wortelrot van chrysanten. (**Root rot of chrysanthemum.**) [French, English and German summaries ½ p. each.] *Meded. LandbHogesch. Gent*, 1964, **29**: 856-66.

A particular type of root damage to pot plants was shown in trials to be a physiological disorder probably caused by over-watering. Overhead sprinkling rather than soil watering is recommended as a preventive measure.

8142. MAATSCH, R., AND BACHTHALER, E.
Sonntags nie! Nicht unterbrochene und periodisch unterbrochene Kurztagbehandlung bei Chrysanthemen. (**Never on Sundays! Uninterrupted and periodically interrupted short-day treatment of chrysanthemums.**) *Gartenwelt*, 1965, **65**: 218-19, bibl. 2, illus.

The best quality plants of several varieties were obtained by uninterrupted short-day treatment. The effects on growth of one day of normal length every week-end were slight and the labour saved was justified. Interruption by 2 days of normal length every week-end resulted in a loss of quality, stem elongation and profuse but delayed flowering, especially in pot plants. In some varieties these effects could be reduced by an initial uninterrupted period of 10–12 days.—Tech. Hochsch. Hannover.

8143. ROTHENBERGER, R. R.
Studies of translocation, metabolism and environmental responses of ornamental plants to chemical growth retardants. *Diss. Abstr.*, 1965, **25**: 3780-1, being *Order No.* 64-13,303 of 210 pp.

The growth retardant B-9 (n-dimethyl-aminosuccinamic acid) was readily translocated throughout chrysanthemum plants when applied either to the roots or to the leaves. Two chrysanthemum varieties differed in their rates of foliar absorption of B-9 but there was no difference in absorption by the roots of the 2 varieties. Chromatographic analysis of alcohol extracts of treated plants showed that B-9 was not broken down by the plant. Two other substances, Phosfon and Cycocel, produced different responses in different varieties of chrysanthemum and poinsettia, respectively, whereas B-9 did not show marked varietal differences in response. —Univ. Mo.

8144. Kaukovirta, E.
Om inverkan av tillväxthämmande medel på chrysanthemum och julstjärna. **(The effect of dwarfing substances on chrysanthemums and poinsettias.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 309-11.

Results of trials in Finland are summarized. Phosfon D and CCC had a greater effect on poinsettias than on chrysanthemums. With chrysanthemums the influence of Amo-1618 was so marked that short-day treatment had little further effect. Phosfon D did not affect flower size in chrysanthemums, but CCC treatment resulted in larger flowers than those produced under long-day conditions. None of the treatments markedly affected poinsettia flowering, although in one or two cases the number of coloured bracts was increased by 20% following the application of CCC. [See also *H.A.*, 34: 3119.]

8145. Gandy, D. G.
Itersonilia perplexans **on chrysanthemums: some environmental factors affecting atmospheric spore concentration.** *Trans. Brit. mycol. Soc.*, 1965, **48**: 117-28, bibl. 8.

Humidity and temperature [see also *H.A.*, 34: 3122].

8146. Tammen, J.
Ray speck—a new flower blight disease of chrysanthemum in Pennsylvania. *Science for the Farmer*, 1965, **12**(3): 13.

Dust-like specks on the ray florets of chrysanthemums were found to be due to combined infection with *Stemphylium* and *Alternaria* spp. Most commercial varieties proved to be susceptible to the disease. The use of overhead watering in the flowering stage should be avoided, or, where this is impracticable, zineb dusts or sprays should be applied. Epidemics of the disease can occur when day and night temperatures range between 70° and 80° F. and the flowers remain moist for more than 12 hours. [See also *H.A.*, 34: 1008.]

8147. Cranston, D. M., and Newton, P.
A trouble-free test for the presence of eelworms on chrysanthemum. *Plant Path.*, 1965, **14**: 74, bibl. 1.

Leaves suspected of infestation with *Aphelenchoides ritzema-bosi* "are enclosed in a new or a clean dry polythene bag and the bag made air tight. The bag is then left for about 12 hours at a temperature not less than room temperature (18° C.). If eelworms are present 'trails' will be seen in the condensed droplets on the inside of the polythene. The 'trails' can be followed and the eelworms seen with the aid of a hand lens or with the naked eye. Within two days the droplets coalesce into drops about 3 mm. in diameter. The eelworms will collect in these drops and can easily be seen."—Univ. Manchester.

Geraniums or pelargoniums.

8148. Mastalerz, J. W.
Geranium stock plants. *Pa Flower Grs' Bull.*, 1965, No. 171, p. 3-6, illus.

The following 5 types of stock plant were planted at various times of the year and compared for yields of terminal and stem cuttings: conventional stocks grown for about 2 years and producing terminal cuttings only; stocks grown in tree form with the main shoot left unstopped until December; tree-stocks with all shoots stopped regularly until November; and tree-stocks with all terminal shoots removed as cutting material in lieu of stopping, grown with either 1 or 2 main stems. The tree-stocks were finally cut up into stem cuttings at the end of the season. The most productive types were the modified tree-stocks with shoots removed as cuttings; the yield was not increased by growing 2 main stems instead of 1. Stopping the shoots in order to "store" cuttings on the plant reduced the yield of terminal cuttings. Spacing the plants at 12×18 in. resulted in slightly fewer, but better quality, cuttings compared with spacing at 12×12 in. or 8×8 in. Propagation of cuttings in March and April appeared to be the most economical method in terms of greenhouse space. Stem cuttings produced better shaped plants than did terminal cuttings.

8149. Øydvin, J.
Lagring av pelargoniastiklinger. **(Storage of geranium cuttings.)** *Gartneryrket*, 1965, **55**: 558-60, illus.

Dry storage of geranium cuttings in plastic bags was not satisfactory. Following storage at 0° C. for 2 weeks rooting was reduced by 40–50%; after a longer period of storage only 15–20% rooting was obtained and there was considerable leaf drop. After cuttings had been stored for 3 weeks with their bases in water at 3° C. 90–100% rooting was obtained in the absence of any disease. "Wet" storage in subdued light gave better results than "wet" storage in the dark.

8150. Forsberg, J. L.
A new fungicide for botrytis control. *Ill. St. Flor. Ass. Bull.*, 1965, No. 260, pp. 11-12, bibl. 1.

Cuttings of 72 geranium varieties were treated with a basal dip of Daconil 2787 (13·6 g. of 75% w.p. per gal.) before being rooted under mist. A suspension of *Botrytis* spores was sprayed over treated and untreated cuttings. Only 2·9% of the treated cuttings became infected compared with 85% of those not treated. The chemical showed good persistence under conditions of mist propagation.—Ill. nat. Hist. Survey, Urbana.

8151. Boettcher, A. D., and Hildebrandt, A. C.
Growth and differentiation of geranium apical meristems *in vitro*. From abstr. in *Phytopathology*, 1964, **54**: 889.

Stem tips, 1 and 5 mm. long, were isolated from 14 varieties and selections of geranium. Media for growth of meristems contained various combinations of mineral salts, sucrose, glucose, vitamins, α-NAA, IAA and i-inositol. Geranium stem tips sterilized with 1% Alconox plus 0·5% sodium hypochlorite grew better than those treated with 95% alcohol plus 0·5% sodium hypochlorite. The best callus formation, stem elongation and root development resulted on meristems grown on a mineral salt+coconut milk medium (C-medium). Four and 8 mg./l. of IAA used with several kinetin levels in a synthetic medium induced meristem growth comparable to that obtained on C-medium. Meristems that rooted on the various media were transplanted to mixtures of soil, sand and vermiculite. Callus differentiation and root formation were induced from single cells and small groups of cells grown in liquid medium and later plated on agar medium. [See also *H.A.*, 33: 3351.]—Univ. Wis., Madison.

8152. Troxler, R. F., and Hamilton, R. H.
The metabolism of indole-3-acetic acid by geranium stem callus cultures. *Plant Physiol.*, 1965, **40**: 400-5, bibl. 19.

Stem calluses displayed a typical growth pattern during 30-day periods of culture with IAA. Growth continued if IAA was replaced by NAA or 2,4-D in the tissue culture medium but did not occur in the absence of an auxin.—Pa St. Univ., University Park.

8153. Lemattre, M.
La maladie bactérienne du *Pelargonium* due au *Xanthomonas pelargonii* (Brown) Starr et Burk. **(The bacterial disease of *Pelargonium* caused by *Xanthomonas pelargonii*.)** [English summary ⅓ p.] *Ann. Épiphyt.*, 1965, **16**: 5-35, bibl. 50, illus.

A study of different routes of infection demonstrated that mechanical injuries caused by leaf thinning provided a natural point of entry for the disease. The duration of receptivity to infection of these injured areas was investigated by means of periodic leaf thinning and inoculation, and the susceptibility of the 4 varieties used was found to be related to the rate of scarring of the injured areas.—Stat. cent. Path. vég., Versailles.

8154. Manzoni, L.
La ruggine dei gerani zonati. **(Geranium rust.)** *Ital. agric.*, 1965, **102**: 526-30, bibl. 5, illus.

The spread of *Puccinia pelargonii-zonalis* from South Africa to East Africa, Australasia and Europe is described. The first appearance of the disease on geraniums in one Italian locality followed the arrival of chrysanthemum flowers and cuttings from an affected locality. Treatment of the plants, pots and ground with 3% bordeaux mixture is recommended after drastic pruning or decapitation of the plants and destruction of the diseased material. Grouet's work on heat therapy [see *H.A.*, 33: 7511] is briefly mentioned.

8155. Gerlach, W.
Eine neue Pilzkrankheit breitet sich in Europa aus: der Pelargonienrost (*Puccinia pelargonii-zonalis* Doidge). **(A new fungus disease, geranium rust (*Puccinia pelargonii-zonalis*), is spreading in Europe.)** *NachrBl. dtsch. PflSchDienst., Braunschweig*, 1965, **17**: 97-100, bibl. 26, illus.

The first appearance in Germany is reported and control measures adopted in other countries are outlined.

Other annual and herbaceous plants.

(*See also* 8133, 8512.)

8156. Abernathie, J. W., Pope, T. E., and Buxton, J. W.
Garden flower variety test in Kentucky, 1964. *Progr. Rep. Ky agric. Exp. Stat.* 149, 1965, pp. 8.

An evaluation of numerous varieties of 24 species of annuals based on their performance as bedding plants from July to September.

8157. Smeal, P. L.
Annual flowers—1964 variety trials. *Res. Rep. Va agric. Exp. Stat.* 99, 1965, pp. 20.

Fifty-two annuals from different seed sources evaluated.

8158. Okada, M., and Yasuoka, J.
Effect of gibberellin on the germination of some light-sensitive seeds when applied by foliar spray or capsule soaking. [Japanese, with English summary ¾ p.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 345-56, bibl. 14.

In trials on *Primula malacoides*, *Sinningia speciosa*, *Calceolaria herbeohybrida* and *Nicotiana tabacum* the stock plants were sprayed with GA at flowering or at the immature seed capsule stage, or else the capsules were soaked immediately after picking in solutions of GA at various concentrations. Seeds from the treated plants or capsules were stored for a few months before being germinated in the light or in darkness. Primula seeds (particularly those treated at an immature stage) from capsules soaked in 500 p.p.m. GA showed a high percentage germination (68–72% on average) in the dark, whereas no seeds from untreated plants germinated. Those from sprayed plants showed 40% germination in the dark. The effects of treatment lasted during at least 15 months of storage. Soaking the capsules also increased the percentage germination in the dark of gloxinia, calceolaria and tobacco seeds, but foliar applications had little effect. In tobacco the effects were greater on immature than on mature seeds and increased with increasing concentrations of GA.

8159. Pillai, S. K., George, O. M., and Vijayalekshmi, P.
Apical organization of the roots of dicotyledons. III. Root apices of some members of the Compositae. *Proc. Indian Acad. Sci., Sect. B*, 1965, **61**: 296-308, bibl. 23, illus.

Including *Calendula officinalis*, *Centaurea cyanus*, *Gaillardia picta* and *Zinnia elegans*. [See *H.A.*, 31: 6565 for a similar study on Zingiberaceae.]

8160. Velemínský, J., Gichner, T., and Pokorný, V.
The effect of inhibitors on the mutagenic activity of N-methyl-N-nitrosourea and N-ethyl-N-nitrosourea in *Arabidopsis thaliana*. *Biol. Plant., Prague*, 1965, 7: 325-9, bibl. 9.

A respiratory inhibitor (NaN_3) and anaerobic conditions (N) reduced the mutagenic activity of N-ethyl-N-nitrosourea and N-methyl-N-nitrosourea in *Arabidopsis thaliana*. An uncoupling agent (DNP) increased the effect of both nitrosoureas, but this may not have been caused by the specific action of DNP. [From authors' abstract.]—Czech. Acad. Sci., Prague.

8161. Strube, H.
Neue Erkenntnisse und Erfahrungen in der Asternzüchtung. I und II. **(New knowledge and results in aster breeding. I and II.)** *Dtsche Gartenb.*, 1965, **12**: 134-6, illus.; and 165-6, bibl. 4.

The first article discusses the classification of asters, aims of breeding, flower biology, hybridization and selection. The second deals with breeding for resistance to *Fusarium* stem rot, *Fusarium* wilt and *Verticillium* wilt and the use of heterosis.

8162. Saini, R. S., and Peterson, A. G.
Colonization of yellows-infected asters by two species of aphids. *J. econ. Ent.*, 1965, **58**: 537-9, bibl. 13.

Myzus persicae was able to colonize asters (*Callistephus chinensis*) infected with aster yellows virus and flowers of healthy plants, but could not survive on foliage of healthy asters. Aphids "conditioned" for 44 days on yellowed asters appeared to survive longer on healthy asters than aphids from the stock culture on cabbage. However, the conditioned aphids did not increase as rapidly on yellowed asters as the control aphids from cabbage. *Rhopalosiphum padi* maintained its numbers on yellowed asters, but survived only 3 to 7 days on healthy asters. [From authors' abstract.]—Univ. Minn., St. Paul.

8163. Pavgi, M. S., and Mukhopadhyay, A. N.
Anthracnose of butterfly pea. [German summary 9 lines.] *Phytopath. Z.*, 1965, **53**: 167-73, bibl. 10, illus.

The disease symptoms, host range and pathogenicity of *Colletotrichum dematium* f. spec. *clitoriicola*, causing anthracnose of the butterfly pea (*Clitoria ternatea*), are described. Control by pruning, field sanitation and the destruction of plant debris is suggested.—Coll. Agric., Banaras Hindu Univ.

8164. Garber, E. D., and Unni, M. K.
The genus *Collinsia*. XXIV. Taxonomic status of *C. stricta* Greene.
Garber, E. D.
Idem. XXV. Additional evidence for preferential pairing in two amphidiploids and two triploid interspecific hybrids. *Bot. Gaz.*, 1965, **126**: 133-6, bibl. 12; and 130-3, bibl. 8.

Genetical and cytological findings indicate that *Collinsia stricta* merits specific status and should not be considered as a variety of either *C. bartsiaefolia* or *C. tinctoria*. Part XXV deals with the cytology of the hybrids *C. heterophylla* × *C. corymbosa*, *C. multicolor* × *C. heterophylla*, *C. heterophylla* × *C. stricta* and *C. stricta* × *C. multicolor*. [For part XXIII see *H.A.*, 34: 7059.]—Univ. Chicago, Ill.

8165. Götting, C.
Einfluss der Temperatur auf die Blutenbildung bei *Columnea kewensis*. **(The influence of temperature on flower development in *Columnea kewensis*.)** *Zierpflanzenbau*, 1965, **5**: 333, illus.

The optimum temperature for flower development was 15° C. Deviations of 1–2° had little effect, but higher temperatures could inhibit development. To encourage flowering in early March the plants should be subjected to a cool period of 30–40 days during which temperatures are not allowed to rise over 15° to prevent excessive vegetative growth.

8166. Herklotz, A.
Über den Einfluss der Temperatur auf das Blühen von *Columnea* × *kewensis* hort. **(The effect of temperature on the flowering of *Columnea* × *kewensis*.)** [English and French summaries ⅓ p. each.] *Gartenbauwiss.*, 1965, **30**: 99-106, bibl. 8.

Plants at different stages of growth (4–15 pairs of leaves) were grown at temperatures ranging from 2° to 25° C. for 20–80 days. At temperatures below 10° the plants died within about 40 days. Inflorescence initiation occurred at 10°–18°, and all plants flowered after 30 days at 15°, though the response after 60 days was even better. Vegetative growth increased up to 25°. Flower formation kept pace with new leaf formation, but in plants treated at the 15-leaf-pair stage fewer inflorescences formed below the 15th pair of leaves, as vegetative axillary buds had already been differentiated. Differences in day length did not apparently affect flower formation.—Tech. Hochsch. Hannover.

8167. Legro, R. A. H.
Delphinium breeding. Reprint from *Genetics Today*, being *Proc. 11th int. Congr. Genet., The Hague, 1963*, 1964, pp. 51-5.

The paper describes crosses which have been made between *Delphinium elatum* and *D. nudicaule*, *D. cardinale* and *D. zalil* with the object of obtaining red flower colour. [See also *H.A.*, 35: 6052.]

8168. Tiagi, Y. D., and Kshetrapal, S.
On the occurrence of recurrent bundles in the floral cup of *Eschscholtzia californica* Benth. *Curr. Sci.*, 1964, **33**: 627-8, bibl. 3, illus.

A cross-section of the lower region of the floral cup revealed 4 concentric rings of bundles.—Univ. Saugar.

8169. Weber, R.
Kulturversuche mit *Gerbera-jamesonii*-Hybriden. **(Cultivation trials with *Gerbera jamesonii* hybrids.)** *Zierpflanzenbau*, 1965, **5**: 505-9, illus.

See *H.A.*, 35: 6054.

8170. Bowe, R.
Der Einfluss verschiedener Düngervariationen und Konzentrationsabstufungen auf *Gerbera jamesonii* in jüngeren Moostorfen als vereinfachten Kultursubstraten. **(The influence of different combinations and concentrations of fertilizers on *Gerbera jamesonii* in young moss peats as simplified cultural substrates.)** [Russian and English summaries 8-10 lines.] *Arch. Gartenb.*, 1965, **13**: 3-14, bibl. 11.

A fuller account of work abstracted in *H.A.*, 35: 1352.

8171. Stouffer, R. F.
Isolation of tobacco rattle virus from Transvaal daisy, *Gerbera jamesonii*. From abstr. in *Phytopathology*, 1965, **55**: 501.

Yellow or black annulated ringspots were observed on the foliage of field-grown plants of *Gerbera jamesonii*. Necrotic local lesions were produced on 6 species of indicator plant. The gerbera isolate was identified as a strain of tobacco rattle virus. This is thought to be the first report of this virus on gerberas.—Univ. Fla, Gainesville.

8172. Powell, W. M., and Pokorny, F. A.
Greenhouse studies on the control of root-knot nematodes on *Hydrocotyle sibthorpioides*. From abstr. in *Phytopathology*, 1965, **55**: 501.

Nemagon was tested for effectiveness in controlling root-knot nematodes, *Meloidogyne incognita*, and for phytotoxicity on *Hydrocotyle sibthorpioides*. Four rates (0, 7·5, 15 and 22·5 ml. of 70% Nemagon/sq. yd.) were drenched onto greenhouse plots of infected material. Significantly more new growth and greater average leaf diameters were obtained with all nematicide rates. Conversely, nematode populations and the amount of root galling were significantly reduced in treated plots. Phytotoxicity was expressed primarily as temporary foliar chlorosis; it was relatively insignificant at the 2 lower rates but was more noticeable at the highest rate of Nemagon. Plants from all treated plots recovered within 2 weeks.—Univ. Ga, Athens.

8173. Hughes, A. P.
Plant growth and aerial environment. VI. The apparent efficiency of conversion of light energy of different spectral compositions by *Impatiens parviflora*. VII. The growth of *Impatiens parviflora* in very low light intensities. *New Phytol.*, 1965, **64**: 48-54, bibl. 8; and 55-64, bibl. 6.

Part VI. The apparent efficiency of conversion of incident light energy ($\epsilon_{\text{app/i}}$) by whole plants of *Impatiens parviflora* ranged from 1·3% in full natural daylight to 7·5% in extreme shade (metal shades transmitting 7% daylight). The corresponding figures for real efficiency, i.e. corrected for respiration losses, ($\epsilon_{\text{true/i}}$) were 3·0% and 12·5% respectively. In growth cabinets with light intensities roughly equivalent to –15% daylight a combination of 2 blue/6 de luxe warm white fluorescent tubes gave values of $\epsilon_{app/i}$ averaging ·4% for plants grown at 15° C., 5·9% for those at 10° and 6·5% at 20°. Four daylight/4 de luxe warm white averaged 5·8% at 20°, and red (magnesium arsenate) at 10° was highest with 7·7%. Blue tubes gave 6·0% apparent efficiency with plants at 15°. In all the cabinet experiments and in the extreme shade in natural daylight the plants were small with leaves scarcely overlapping. In more open, natural daylight sites some self-shading would have occurred. When the efficiency was expressed on a quantum basis, rather than on total energy, and correction for temperature differences applied, there was little difference between blue, blue-white and red, with daylight-white somewhat lower. On the basis of assimilation for a given number of lamps the combinations 2 blue/6 de luxe warm white and 4 daylight/4 de luxe warm white were the best. *Part VII.* Plants were established for 17–23 days in lights of ·7–19 cal./cm.^{2}/day (≡ 10% summer daylight) using 16 hours' fluorescent light in controlled environment cabinets, and were then transferred to lower light intensities in the range 1·5–8·7 cal./cm.^{2}/day (≡0·9–5% summer daylight). The unit leaf rate was linearly related to light intensity over the range 0–20 cal./cm.^{2}/day and the compensation point was approximately 0·3 cal./cm.^{2}/day. The changes in unit leaf rate were closely followed by marked morphogenetic changes, even in plants growing in light intensities so low that there was scarcely any net gain in weight. Over the dry weight range 6–35 mg. low light intensity did not evoke a great increase in leaf area ratio, as, over this range in size, the principal cause of increased leafiness was the increase in leaf weight ratio, which is scarcely affected by light intensity. Plants of dry weight greater than 35 mg. showed the strong reciprocal relationship between unit leaf rate and leaf area ratio due to the effect on specific leaf area. At very low light intensities the increase in leaf area ratio was not adequate to offset the fall in specific leaf area and the relative growth rate was diminished sharply over the light range from 15 cal/cm.^{2}/day to the compensation point for light. [From author's summaries.]—Univ. Reading hort. Res. Labs, Shinfield, Berks.

8174. Hughes, A. P.
Plant growth and the aerial environment. VIII. The effects of (a) blue light and (b) low temperature on *Impatiens parviflora*. *New Phytol.*, 1965, **64**: 323-9, bibl. 7.

Compared with blue-white fluorescent light at 15° C., blue light and low temperature (10°) resulted in a restriction in the rate of leaf growth due primarily to a sharp fall in specific leaf area with increasing plant size, which was much more pronounced at low temperature. There was scarcely any effect on the leaf weight/total dry weight distribution, but the leaves have a much higher dry matter content than those of plants grown in blue-white light. In blue light the unit leaf rate was depressed on an energy basis, but not on a quantum basis. It was also depressed at low temperature. The depression of both unit leaf rate and leafiness resulted in a low relative growth rate in both treatments. The interrelationship between specific leaf area and unit leaf rate did not follow the same pattern as reported previously and this is discussed. The effects attributed to low temperature in field experiments were confirmed. [Author's summary.]—A.R.C. Unit Flower Crop Physiol., Univ. Reading.

8175. Odihirin, R. A., and Jenkins, W. R.
Host-parasite relationship of *Impatiens balsamina* and certain nematodes. *Phytopathology*, 1965, **55**: 763-6, bibl. 20.

A fuller account of work abstracted in *H.A.*, 35: 3790.

8176. Rozumilowski, V.
***Leontopodium* "Viktoria".** *J. roy. hort. Soc.*, 1965, **90**: 218-19, illus.

A description of this hybrid of *L. palibinianum* and (*L. himalayanum*×*L. nivale*), together with notes on its propagation and cultivation.

8177. Haramaki, C., and Atmore, S.
Post-transplant herbicides for bedding plants. I. Marigolds. II. Petunias. *Pa Flower Grs' Bull.*, 1965, No. 173, pp. 1-2; 9-10.

Part I. The following 10 granular herbicides were applied at 3 concentrations to the French marigold Spry 3, 7, 9, 11 and 17 days after they had been planted out: Amiben, chlorpropham, dichlobenil, diuron, EPTC, R-1607, R-4572, SD-7961, simazine and SWEP. All the herbicides gave good weed control for at least 5 weeks at one or more rates of application used. Nine weeks after planting good weed control was still evident in plots treated with 6 of the herbicides at one or more rates of application used. The post-transplant applications of granular herbicides caused little plant injury and little reduction in height. Where plant injury and reduction in height was noticed, it was intensified as the concentration was increased and the time between planting and herbicide application was reduced. *Part II.* The following herbicides were applied at 3 concentrations to Red Satin petunias, 7 as sprays and 7 in granular form, a fortnight after the seedlings were planted out: dacthal, dichlobenil, diphenamid, diuron, Tenoran, TH-052H and trifluralin (as sprays) and chlorpropham, dichlobenil, diphenamid, diuron, EPTC, trifluralin and Vernam (as granules). In general, sprays gave better weed control than granules. Diuron and Tenoran sprays were injurious to the crop at all 3 rates used (1, 2 and 4 lb. and 2, 4 and 8 lb. a.i./acre, respectively) and diuron granules at 2 and 4 lb./acre also caused damage. [For earlier work see *H.A.*, 34: 5130 and 5133.]—Pa St. Univ., University Park.

8178. Olsen, C. M.
A *Fusarium* wilt of *Tagetes* marigolds. *Phytopathology*, 1965, **55**: 711-14, bibl. 12, illus.

A vascular wilt caused heavy losses of African marigolds (*Tagetes erecta*) in southern California seed fields in the autumn of 1957. Pathogenicity of the *Fusarium oxysporum* consistently isolated from these plants was shown with single-spore cultures in steamed soil. A 97–100% loss occurred in the original field variety, but many other commercial varieties were resistant. Mycelium extended to within a few centimetres of the plant apex, and seed transmission (2–10%) occurred. Most commercial varieties of China aster (*Callistephus chinensis*) were highly susceptible to the aster and *Tagetes* forms, expressing similar symptoms. *Tagetes erecta* was highly susceptible to the *Tagetes Fusarium* but less susceptible to the aster form. A reselection of Ball White aster, of which 73·4% of the plants were resistant to aster wilt, and the French marigold (*T. patula*) were highly resistant to the *Tagetes* forms. Other composites such as *Dahlia*, *Chrysanthemum*

(Shasta daisy), *Bellis* (English daisy), *Calendula*, *Dimorphotheca*, *Gaillardia* and *Zinnia* were immune. About 45% of the plants of *Centaurea* Double Blue Boy were susceptible. Pathogenicity to *Tagetes* was retained following passage through aster or *Centaurea*, or growth in culture for at least 1·5 years. Cultures of the aster-wilt and *Tagetes*-wilt organisms are morphologically similar. Evidence is presented that these races are the same forma specialis of *F. oxysporum*. The aster-wilt race is designated as race 1 and the *Tagetes* isolate as race 2 of *F. oxysporum* f. *callistephi*. [Author's abstract.]—Univ. Calif., Berkeley.

8179. Yasuda, I., and Yasui, K.
The effects of the previous night's artificial lighting on the flowering of morning glory. V. The effects on flowering of combinations of different coloured fluorescent lamps and the limiting distance between the lamp and the plant. [Japanese, with English summary ½ p.] *Sci. Rep. Fac. Agric. Okayama*, 1965, No. 25, pp. 25-9, bibl. 5.

Exposure to red light reduced the number of perfect flowers and increased the number of imperfect flowers produced. Blue light increased the number of perfect flowers. When red light was combined with yellow and/or blue light no perfect flowers were produced. Limiting distances between the lamps and plants, beyond which flowering did not occur, differed according to whether the trials were in the open or indoors, the maximum being 3 m. [For part IV see *H.A.*, 35: 3803.]

8180. Tandon, S. L., and Bhutani, K.
Morphological and cytological studies of the colchicine induced tetraploids in *Nemesia strumosa* Benth. *Phyton, Argentina*, 1965, **22**: 41-3, bibl. 10, illus.
Colchicine induced tetraploidy in *Nemesia strumosa* Benth. *Sci. and Cult.*, 1965, **31**: 307-8, bibl. 4, illus.

Morphological and cytological comparisons were made between the diploid (n = 9) and the colchicine-induced tetraploid (n = 18) of *Nemesia strumosa*. The most effective treatment for the induction of tetraploids was found to be 0·1% aqueous colchicine applied twice every 10 hours to the growing points of young seedlings. The induced tetraploids showed the usual characters associated with autotetraploidy, including a significant reduction in pollen fertility and seed setting. The diploids showed normal meiosis, whereas the tetraploids were characterized by a high frequency of unequal distribution of chromosomes at anaphase I. The autotetraploids produced fewer but bigger flowers. [From authors' abstract of first paper.]—Univ. Delhi.

8181. Kumar, S., and Hecht, A.
Inactivation of incompatibility in *Oenothera organensis* following ultraviolet irradiation. *Naturwissenschaften*, 1965, **52**: 398-9, bibl. 4.

Pollen tubes grew only in styles treated with UV light.

8182. Germanjan, N. M.
Trials on the propagation of peonies. [Armenian, with Russian summary.] *Bjull. bot. Sada Akad. Nauk Arm. SSR*, 1963, No. 19, pp. 135-7, from *Ref. Ž.* (*55. Rasten.*), 1964, Abstr. 10.55.376.

Clumps of *Paeonia hybrida* were divided into parts with 2, 3, 5 and 7 buds and planted 2, 3, 5, 7 and 10 cm. deep. Sections with 2 buds grew poorly and did not flower even in the second year, regardless of the depth of planting. Sections with 3 or more buds produced vigorous growth and flowered during the first year after planting. The best planting depth was 5 cm., and spring propagation always gave better results than autumn propagation.

8183. Salisbury, Sir E. J.
The fruiting of the lesser periwinkle (*Vinca minor*) *J. roy. hort. Soc.*, 1965, **90**: 217-18, bibl. 1, illus.

During the summers of 1962 and 1964 fruiting shoots of *Vinca minor* were found. In 1962 most fruits contained only one fertile seed and in 1964 the average was 2 The seeds were sown in August and most germinated during the following April and May, but a few did not germinate for a further year.

8184. Frankel, R.
Transfer of cytoplasmic male sterility between graft components in petunia. From abstr. in *Israel J. agric. Res.*, 1965, **15**: 107.

An experiment was carried out on petunias with a view to transferring the cytoplasmic factor from a male-sterile plant (containing the factor) to a fertile plant (free of the factor) by way of a graft connection. It was found that the cytoplasmic factor could move across the graft connection in both directions. This behaviour seems to indicate that, at least in respect to mobility, the petunia cytoplasmic factor resembles a virus.—Volcani Inst. agric. Res., Rehovot.

8185. Cathey, H. M.
Prescriptions for annual plants—light and chemicals. Reprint from *Flor. Rev.*, 1963, **133**(3458): 64-6, and 1964, **134**(3459): 23-5, bibl. 13, illus.

Most varieties of petunia germinated equally well in either light or darkness, although some required light, the optimum temperature was 70° F. Seed disinfection and high humidity (by means of misting) during germination gave good results. Supplementary lighting accelerated seedling growth and flower formation; short days retarded shoot growth and delayed flowering. Cyclic lighting also accelerated flowering. The effects of treatment with the growth-retardant B-Nine are reported [see *H.A.*, 35: 6048].—U.S.D.A., Beltsville, Md.

8186. Cathey, H. M.
Guidelines for using B-Nine on garden annuals. *Ill. St. Flor. Ass. Bull.*, 1965, No. 258, pp. 1-2.

Trials with several annuals, notably petunias, are described [see also *H.A.*, 35: 6048]. Petunia varieties differed in their response, some showing little effect from 3 weekly sprays of B-Nine at 0·5 or 1·0%, while others remained compact throughout the summer when B-Nine was applied every third week at 0·25%. Recommendations are given on the use of B-Nine on petunias and other responsive annuals, which include China aster, calendula, phlox, cornflower, American marigold, snapdragon, salvia, celosia, cleome, perilla and zinnia.—U.S.D.A., Beltsville, Md.

8187. Panchal, Y. C.
Some physiological studies of *Petunia hybrida* Vilm. pollen. *Diss. Abstr.*, 1964, **25**: 3227, being *Order No.* 64-13,239 of 91 pp.

Studies were made on the germination and tube growth of *P. hybrida* pollen using the hanging drop technique. Gibberellin, kinetin and IAA, added to the nutrient medium at 40, 20 and 10 p.p.m., respectively, increased germination by 8–12% over the controls, but this effect was not significant. Stimulation of tube growth by these substances, however, was highly significant, being 200% with 20 p.p.m. kinetin, 180% with 40 p.p.m.

gibberellin and 150% with 10 p.p.m. IAA. A pH value between 6 and 7 was optimal for both germination and tube growth, the optimal pH varying slightly for different growth substances. In general, no advantage was obtained by mixing the growth substances, although kinetin, mixed with IAA or gibberellin, produced a slight synergistic action on tube growth at the correct concentrations.—Kans. St. Univ.

8188. STANLEY, R. G., AND LINSKENS, H. F.
Protein diffusion from germinating pollen. *Physiol. Plant.*, 1965, **18**: 47-53, bibl. 12.

Protein levels diffusing from petunia pollen were assayed. Although pollen tubes were only apparent after one-half hour's growth at 26° C., Lowry-reacting material, absorbing at 325 nm., was evident within minutes after pollen was placed in a germinating medium. The material absorbing at 325 nm. was dissolved from the pollen in water in amounts independent of temperature. This initial material was probably flavonoid in nature, rather than protein. After 15 minutes some absorption was apparent in the protein region of 285 nm., and absorption in the spectrum region of proteins became more pronounced as germination advanced. After pollen tubes became apparent, a small absorption peak was observed in the germinating medium at 265 nm. This may indicate the presence of free nucleotide or flavonoid components. Enzyme activity, assayed by release of $C^{14}O_2$ from radioactive sucrose, was detected within 5 minutes after pollen was placed at 26°. Enzyme activity was initially associated with the pollen grain rather than with the surrounding solution. Using mannitol to control the osmotic environment, the maximum enzyme activity was observed to occur at or below 0·33 *M*. Protein, or possibly flavonoid compounds, rapidly secreted from germinating pollen may be related to the incompatibility reactions with maternal tissue. [From authors' summary. See also *H.A.*, 34: 7067.]—U.S.D.A., Berkeley, Calif., and Univ. Nijmegen, Netherlands.

8189. PHILLIPS, D. J.
Home garden control of *Phytophthora* crown rot of petunia. *Colo. Flower Grs' Ass. Bull.*, 1965, No. 183, pp. 1-2, bibl. 2, illus.

Various garden sites with a previous history of infection with *Phytophthora parasitica* and/or petunia deaths were treated with Mylone at 0·8 lb. a.i./100 sq. ft. applied alone or in combination with weekly Dexon drenches at 1 lb. of 70% material in 15 gal. water/50 sq. ft. Mylone was applied 4 weeks before planting petunias and the first Dexon drench coincided with the planting date. Losses from crown rot were absent or very small on all plots, with the exception of one plot where the petunias were found to have been infected before planting. No phytotoxicity was associated with the Dexon drenches. [For earlier work see *H.A.*, 34: 5136.]

8190. THOMPSON, H. S., AND SVEJDA, F. J.
Resistance to powdery mildew in perennial phlox. *Canad. J. Plant Sci.*, 1965, **45**: 258-63, bibl. 7.

All 49 cultivars of *Phlox paniculata* tested proved susceptible to *Erysiphe cichoracearum*, although 2 (Pyramid White and No. 60–75) showed initial field resistance. It appeared that first-year plants were more resistant than plants 3 years old or more. Results from breeding for improved resistance were not promising.—Canada Dep. Agric., Ottawa.

8191. MÜNCH, J., AND FRITZSCHE, G.
Ergebnisse eines 5jährigen Sortenvergleiches mit *Primula malacoides*. **(Results of 5 years' variety trials with *Primula malacoides*.)** *Gartenwelt*, 1965, **65**: 265-9, illus.

Including tabulated data on flower and growth characteristics of 52 varieties studied at Weihenstephan.

8192. HIEKE, K.
Vliv některých stimulačních látek na klíčení semene *Primula obconica* Hance. **(The effect of some stimulants on seed germination in *Primula obconica*.)** [English, Russian and German summaries ½ p. each.] *Acta průhoniciana*, 1964, No. 10, pp. 1-8, bibl. 8.

Primula seeds were soaked in solutions of IAA, IBA or nicotinic acid at 10 to 100 mg./l. and IAA+nicotinic acid and IBA+nicotinic acid at 10+10 to 50+50 mg./l. for 12 or 24 hours, and their germination was compared with that of seeds soaked in distilled water or sown dry. IAA at 50 mg./l. and IAA+nicotinic acid at 10+10 mg./l. for 12 hours accelerated germination and increased the germination percentage compared with soaking in water, whereas the other treatments tended to inhibit germination.

8193. ROOK, A., AND WILSON, H. T. H.
Primula dermatitis. *Brit. med. J.*, reprinted in *Gdnrs' Chron.*, 1965, **158**: 110-11, bibl. 10, illus.

Examples and symptoms of dermatitis caused by sensitivity to *Primula obconica*, which contains primin.

8194. D'CRUZ, R., AND JADHAV, A. S.
Flower colour in salvia. *Sci. and Cult.*, 1965, **31**: 201, bibl. 2.

The red, magenta, dark pink and pink types of *Salvia coccinea* were crossed and their genetic behaviour was studied. The F_2 results are presented in tabulated form. —Coll. Agric., Poona.

8195. HALEVY, A. H., AND WITTWER, S. H.
Growth promotion in the snapdragon by CCC, a growth retardant. *Naturwissenschaften*, 1965, **52**: 310, bibl. 5, illus.

Height and stem dry weight were increased by foliar sprays of CCC at 50 to 3,000 p.p.m. but reduced at 4,000 p.p.m. The optimum concentration for growth stimulation was 500 p.p.m.—Mich. St. Univ., E. Lansing.

8196. HACKBARTH, H.-J.
Über den Einfluss von Nährionen auf die Keimung von *Matthiola incana*. **(The effect of nutrient ions on the germination of *Matthiola incana*.)** [English and French summaries 6 lines each.] *Gartenbauwiss.*, 1965, **30**: 91-8, bibl. 3, illus.

Stock seeds were germinated on moist filter paper at 20±1° C. prior to sowing. Measurements of the percentage germination of seeds at nutrient ion concentrations of 0·2 to 5%, and of the tolerance range within which average germination was not retarded by more than 50% of that with pure water (in 40·8 hours), showed that PO_4 and NH_4 ions were the most toxic. The decreasing order of tolerance was Ca > Mg > K > NH_4 for cations, and SO_4 > P for anions. The inhibiting effect of NH_4 was also apparent in association with nitrate and chloride. The two biotypes (dark-leaved/single flowered and light-leaved/double flowered) did not differ in their reaction.—Tech. Hochsch. Hannover.

8197. Jongkind, M.
Violen kunnen een redelijke opbrengst geven mits . . . **(Violas can give a reasonable return provided that . . .)** *Vakbl. Bloemist.*, 1965, **20**: 795, illus.

Cultural recommendations for raising violas as bedding plants and the average market returns for 5 years are given, together with a list of strains which performed well in an earlier trial at Aalsmeer. [For methods of weed control see *H.A.*, 35: 3823.]

8198. Ecker, G.
Unkrautbekämpfung in Stiefmütterchen. **(Weed control in pansies.)** *Dtsche Gärtnerbörse*, 1965, **65**: 323.

During 1961-63 the economics of chemical and mechanical weed control in pansies (*Viola wittrockiana*) were compared. The total cost of chemical weed control, using Shell Unkrauttod A (20 c.c. in 4 l. water/sq. m.) was 17 Pf./sq. m., whereas mechanical operations (hoeing and weeding) cost 44 Pf./sq. m.—PflSchAmt Karlsruhe.

8199. Veerman, A., and van Zon, J. C. J.
Insect pollination of pansies (*Viola* spp.). [German summary ⅓ p.] *Ent. exp. appl.*, 1965, **8**: 121-34, bibl. 7, illus.

Experiments with caged flowers proved that insect pollination is necessary before pansies set seed. Observations on insects visiting pansies grown for seed production in the Netherlands showed that bumble-bees (*Bombus* spp.) and moths (*Plusia gamma*) were the only efficient pollinators. In about 60% of the cases only one flower per plant was visited by any insect regardless of species. [From authors' summary.]—Univ. Amsterdam.

8200. Srivastava, V. K.
Colchicine-treated zinnia. *Sci. and Cult.*, 1965, **31**: 200-1, bibl. 9.

Colchicine-treated plants showed stunted growth, shorter internodes, thicker leaves, more laterals and more and larger flowers than untreated plants. A significant reduction was found in the number of stomata per unit area, with a corresponding increase in their size. The pollen grains of treated plants were significantly larger than those of the controls, and pollen sterility ranged from 36·2 to 69·8% compared with the normal range of 6·4 to 38·5%.—Coll. Agric., Jobner, Rajasthan.

Begonias.

8201. Heide, O. M.
Photoperiodic effects on the regeneration ability of *Begonia* leaf cuttings. *Physiol. Plant.*, 1965, **18**: 185-90, bibl. 9, illus.

Attempts to separate the effect of day-length from that of the daily light energy supply on the regeneration ability of *Begonia* × *cheimantha* leaf cuttings revealed that short days (8 and 10 hours) clearly enhanced bud formation regardless of the daily light energy. In most cases short days also suppressed root formation compared with 16-hour days and continuous light. Since a night interruption lasting 4 hours was also effective in suppressing bud formation, it is concluded that a specific photoperiodic reaction must be involved in the control of regeneration, and that this reaction is in part responsible for the seasonal changes in the regeneration ability of such cuttings. [Author's summary. See also *H.A.*, 35: 3825 and 3826.]—Agric. Coll. Norway, Vollebekk.

8202. Skalská, E.
Vliv vyštipování květů a poupat na velikost hlíz u hlíznatých begonií. **(The effect of pinching out the flowers and buds on tuber size in tuberous begonias.)** [Russian and German summaries ½ p. each.] *Rostlinná Výroba*, 1965, **11**: 111-18, bibl. 7, illus.

In 3 years' trials with begonia seedlings flower and bud removal significantly increased the proportion of large tubers compared with the controls. Deblossoming started at the end of July or early August gave the best results. At this time the days also became shorter, which further promoted tuber growth. Returns from tubers from deblossomed plants, after deducting the cost of the treatment, were 25% higher than returns from tubers from the untreated plants.

8203. Maatsch, R., and Herklotz, A.
Über den Einfluss der Lagertemperatur auf die Ruhe von Knollenbegonien. **(The effect of storage temperature on the dormancy of tuberous begonias.)** [English and French summaries ⅓ p. each.] *Gartenbauwiss.*, 1965, **30**: 69-74, bibl. 9.

Tubers of *Begonia tuberhybrida* (4–9 g. and 10–21 g.) were stored for various periods at different temperatures before being planted at 23–25° C. Dormancy was broken most quickly at the lower temperatures. Therefore with short storage periods, of up to only 30 days, temperatures of 1–5° C. were the most effective. The tubers remained dormant longest at 15–20°. At temperatures higher than this (25–35°) the tubers sprouted more rapidly, but losses due to rots occurred during long storage either dry in polythene bags or in moist peat. After 90 days' storage the percentage sprouting was much the same in all the temperature treatments.—Inst. ZierpflB., tech. Hochsch., Hannover.

8204. Genkel', P. A., Bakanova, L. V., and Samygin, G. A.
The freezing of cold-sensitive plants. [Russian, with English summary ½ p.] *Fiziol. Rast.*, 1965, **12**: 69-75, bibl. 14, illus.

Detached leaves of *Begonia metallica* kept at 2° C. for 5 to 8 days were injured and even partially killed. Exposure of detached leaves to temperatures of −5° or −10° C. for 1 or 2 minutes did not cause any injury. Longer exposure of the plants to a temperature of −10° C. caused increasing injury to the leaves, which were completely killed following 15 minutes' exposure. The injury was caused by the formation of ice in the tissue, and the degree of injury was related to the amount of ice formed. Older leaves suffered more injury than younger ones.

Cyclamen.

(*See also* 7739.)

8205. Palmer, The Hon. L., and Synge, P. M.
The winter-flowering cyclamen. *J. roy. hort. Soc.*, 1965, **90**: 293-6.

Species and forms described.

8206. Meikle, R. D.
Some notes on *Cyclamen coum*. *J. roy. hort. Soc.*, 1965, **90**: 296-8, illus.

Nomenclature and taxonomy.

8207. Palmer, The Hon. L., and Meikle, R. D.
A new cyclamen from Rhodes, *Cyclamen repandum* var. *rhodense*. *J. roy. hort. Soc.*, 1965, **90**: 291-3, illus.

A detailed botanical description.

208. Elefteriu, E.
Stabilirea agrotehnicii culturii cyclamenului în regiunea Bucureşti. **(Cultural methods for cyclamen growing in the Bucharest region.)** [French and German summaries ⅛ p. each.] *Lucr. şti. Inst. agron. N. Bălcescu, Ser. B*, 1964, **7**: 141-7, bibl. 1.

neutral or slightly alkaline potting compost containing af mould from local sources proved superior to the andard acid compost containing beech leaf mould and eat.

209. Rothenburger, W.
Arbeitsbedarfszahlen im Gartenbau. **(Labour requirement figures in horticulture.)** *Dtsche GartenbWirt.*, 1965, **13**: 107-8, 110 and 112.

ncluding tabulated data from time and motion studies n the potting of cyclamen.

210. Scholten, G.
Wortelrot bij Cyclamen. **(Root rot of cyclamen.)** *Vakbl. Bloemist.*, 1965, **20**: 691, 693, illus.

n trials to control root rot caused by *Nectria radicicola* oth soil steaming and the addition of zineb (500 g./ u. m.) to the soil proved satisfactory. For controlling fection by *Thielaviopsis basicola* comparisons were ade between zineb, maneb, thiram, captan, Phaltan nd Tuzet. Tuzet gave very good control when applied s a soil drench at 2 g./l. water and did not check the owth of the plants, although their initial growth was ightly less vigorous than that made in steamed soil. For earlier work see *H.A.*, 34: 7086.]—Inst. plZiekt. nderz., Wageningen.

211. Van Winckel, A., and Van Assche, C.
Het gebruik van een mengsel dithiocarbamaten in de bestrijding van *Thielaviopsis basicola* bij cyclamen. **(The use of a mixture of dithiocarbamates for the control of *Thielaviopsis basicola* on cyclamen.)** [French, English and German summaries 7 or 8 lines each.] *Meded. Landb-Hogesch. Gent*, 1964, **29**: 984-90, bibl. 2.

uzet (40% TMTD, 20% ziram and 20% Urbazide) as applied at 5 rates to the soil prior to sowing cyclaen seeds. The best results with minimum phytoxicity were obtained with 250 g. per cu. m. Germinaion was not reduced by the treatments, but plant growth as retarded particularly by 500 g./cu. m. [For rlier work see *H.A.*, 34: 3171.]

Gladioli.

212. Aycock, R., and Milholland, R. D.
Heat curing treatments of gladiolus corms compared with fungicidal dips in controlling *Fusarium* disease. *Plant Dis. Reptr*, 1965, **49**: 435-8, bibl. 12.

fuller account of work abstracted in *H.A.*, 35: 6091.

Irises.

213. Kurki, L.
Växtstörningar inom uppdrivning ar blomsterlökar. **(Growth disturbances during the forcing of flower bulbs.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 311-13.

me factors influencing the response to forcing by is × *hollandica* are discussed, that are based on studies ade at the Horticultural Department at Piikkiö, nland. Adequate water throughout forcing has proved essential, the stage when the bud is visible in the shoot being the most sensitive; a short period of drought at this stage reduced flowering from 90% to 20%. Forcing at 20° to 24° F. advanced flowering but reduced the flowering percentage. The need for extra lighting under Finnish conditions was relatively small; at most it was required for 2–3 weeks before flowering started in mid-February. [See also *H.A.*, 33: 7552.]

8214. Gould, C. J., and Russell, T. S.
Soil-borne infection of bulbous iris by *Sclerotinia bulborum* controlled by bulb and soil treatments with PCNB. *Plant Dis. Reptr*, 1965, **49**: 443-6, bibl. 9.

The largest yield of healthy bulbs was obtained by dipping them in a 7·5% suspension of PCNB (75% w.p.) and then dusting the bulbs and the sides of the furrows with PCNB at 200 lb. a.i. per acre. Dusting and dipping alone were each better than the control. Dipping plus dusting produced $1,449 per acre of marketable bulbs compared with $514 in the control. PCNB has also been effective with hyacinths and tulips. —Wash. St. Univ., Puyallup and Pullman.

8215. Gould, C. J., and Russell, T. S.
Efficiency of various methods of applying PCNB for preventing soil-borne infestation of bulbous iris by *Sclerotium rolfsii*. *Plant Dis. Reptr*, 1965, **49**: 149-53, bibl. 5.

In a field experiment on inoculated soil PCNB 75% wettable powder was applied at 3 rates by broadcasting before planting, by dusting in the planting furrow and/or by dipping the bulbs. All 3 methods significantly increased the yield of healthy bulbs, but furrow treatment gave the best control of crown rot (southern blight). The average numbers of marketable bulbs harvested per plot with furrow treatment were 33, 104, 128 and 124 with nil, 100, 150 and 200 lb. of active PCNB per acre. It is considered questionable whether more than 100 lb./acre is worth the extra cost except on very heavily infested soil.—W. Wash. Exp. Stat., Puyallup.

Lilies.

(*See also* 6877.)

8216. Kiplinger, D. C., and Miller, R. O.
Results of lily tests in 1963-1964. *Ohio Flor. Ass. Bull.*, 1965, No. 425, pp. 7-8.

Suitable planting depths, the effects of light and temperature, and the performance of frame-grown and pre-cooled bulbs for forcing were investigated for 8–9-in. lily bulbs. Frame-grown bulbs were slower to flower and bore shorter stems, but produced more buds, than bulbs which had been pre-cooled. Bulbs planted deeply flowered a little later and produced longer stems with more buds than did bulbs which were planted shallowly. Flowering was advanced by long-day treatment and by gentle heat. Plants grown under natural day length at normal temperature (60° F.) produced most buds. Short-day treatment reduced plant height.—Ohio agric. Exp. Stat., Wooster.

Narcissi.

8217. Royal Horticultural Society.
Classified List and International Register of Daffodil Names. R.H.S., London, revised 1965, 8×3½ in., pp. 382, 9s.

This new edition of the Register, replacing that published in 1961, contains several thousand names of which more than 900 are new. Most refer to cultivars; revisions have been made for daffodils which, although of wild origin, have been maintained in cultivation and rank as cultivars. The form of presentation remains unchanged; for each cultivar the classification, names of raiser and registering body, R.H.S. and Haarlem awards and the date of introduction are stated where known, and any synonyms and duplication of names are clearly indicated. The revised system of classification (1950) is shown, and information is provided on the procedure for the registration of daffodil names. The rather odd shape of the original edition remains; the price, commendably, should fit all pockets.

8218. Müller, B.
Neue Narzissen. Versuch einer Bewertung. **(New narcissi. An evaluation trial.)** *Gartenwelt*, 1965, **65**: 310-12, illus.

New varieties are arranged in 15 classes according to floral characteristics. The soils on which they were evaluated were heavy with, for the most part, neutral reactions.

8219. Ministry of Agriculture, London.
Hot water treatment of narcissus and tulip bulbs. *S.T.L. Minist. Agric., Lond.*, **21**, revised 1965, pp. 9.

Provisional recommendations for the control of *Ditylenchus dipsaci*.

8220. Purnell, R. E., and Hague, N. G. M.
Fumigation of agricultural products. XIX—Methyl bromide fumigation of narcissus bulbs infested with stem nematode, *Ditylenchus dipsaci* (Kühn). *J. Sci. Food Agric.*, 1965, **16**: 421-4, bibl. 9.

Bulbs were damaged by methyl bromide at dosages (above 500 mg. hr./l.) lethal to the nematode. Warm storage before fumigation reduced phytotoxicity but also decreased nematode susceptibility. [From authors' abstract. See also *H.A.*, 35: 1391.]—Imp. Coll. Field Stat., Sunninghill, Ascot, Berks.

8221. Winfield, A. L.
Timely action will forestall mite damage. *Grower*, 1965, **64**: 141, illus.

Symptoms of damage are described and control measures suggested for *Steneotarsonemus laticeps* infestations in narcissus bulbs obtained for forcing. In a preliminary trial good results followed dipping bulbs of Carlton for 2 hours in a highly concentrated solution of Thionazin. [For earlier work see *H.A.*, 35: 3854.]—N.A.A.S., Kirton.

Tulips.

8222. Carlsson, G.
Tulpanernas drivningsduglighet i förhållande till blomanlagens utveckling på hösten. **(The forcing capacity of tulips in relation to the development of the flower initials in the autumn.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 313-15, bibl. 2.

Trials over 13 years have shown that the more advanced the stage of development of the growing point is by 19 September, the easier can the tulips be forced.—Gullåkers Växtförädlingsanst.

8223. Strømme, E.
Virkningen av høge temperaturer under transporten på drivingen av kjølepreparert tulipanløk. **(The effect of high temperatures during transport on the forcing of cold-treated tulip bulbs.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 316-19.

There was little difference in earliness of flowering between bulbs imported early into Norway and then cool-stored and bulbs cool-stored in Holland before dispatch. Warm storage at 20° C. for up to a week for cool-stored, prepared bulbs did not affect the length of the flower stalks. Bulbs stored in closed bags at several temperatures did not require a longer period of forcing than bulbs stored in open bags. Bulbs from closed packs, however, produced shorter stems, and the flowers were somewhat misshapen after the bulbs had been stored at higher temperatures (27° C.).

8224. Stoffert, G.
Der Einfluss von Zwiebelabstand, Kistentiefe und Substrat auf das Wachstum von Treibtulpen. **(The effect of spacing, box depth and substrate on the growth of forced tulips.)** [English and French summaries ⅓ p. each.] *Gartenbauwiss.*, 1965, **30**: 75-90, illus.

Trials with the varieties Krelages Triumph, Korneforos and Rose Copland, spaced at 0, 1 and 2 cm. in boxes 2, 4 and 6 cm. deep, containing a light clay soil or peat+lime, did not show any visible qualitative differences, except for broader leaf blades on Krelages Triumph growing in shallow boxes. Reduced spacing slightly increased the ratio length/weight of stem and the time taken to flower. Close packing of bulbs in peat in boxes 4 cm. deep is recommended as being most economical.—Tech. Hochsch. Hannover.

8225. Yokoi, M.
Analyses of quality and yield of cut flowers with particular reference to spacing of plants. III. Cut flower quality and yield of forced tulips in relation to planting density, nutrition and the use of bulbs raised in different textured soils in the preceding generation. *Tech. Bull. Fac. Hort. Chiba*, 1964, No. 12, pp. 37-44, bibl. 10, illus.

William Pitt tulips were forced under glass, at 3 spacings and 3 levels of NPK, from bulbs previously grown either in a sandy loam or on coastal sand dunes. The highest yields and best quality flowers, but with slightly delayed flowering, were obtained with the closest planting (8×8 cm.) and the highest level of fertility (112·6 g. N+93·3 g. P+93·3 g. K per sq. m.) from bulbs previously grown in a sandy loam. There were no differences in leaf numbers and stem diameters between any of the treatments. On average, the dry weights of the shoot minus the bloom and of the flower decreased with closer spacing and lower fertilizer rate; the closer the plant density, the greater was the plant height. Plants grown entirely without NPK had smaller, paler leaves than plants from plots with nutrients, but heavy fertilizer applications did not have marked effects on growth. The more widely spaced plants did not grow more luxuriantly than those at a close spacing. Bulbs previously grown on a sandy loam grew better, but flowered later, than those from sand dunes. [For part II see *H.A.*, 34: 5197.]

8226. Boekel, P.
Teelt van tulpen op slempige percelen. **(Tulip growing on soils subject to panning.)** [English summary ⅓ p.] *Meded. Dir. Tuinb.*, 1965, **28**: 381-7, 417, bibl. 7.

Methods discussed of preventing compaction in silt soils newly brought into cultivation for tulips.

227. Skalská, E.
Možnosti úspěšného hubení plevelů herbicidem CIPC v porostech tulipánů. **(The possibility of successful weed control with CIPC in tulips.)** [English, Russian and German summaries ½ p. each.] *Acta průhoniciana*, 1964, No. 10, pp. 9-20, bibl. 14, illus.

n 2 years' trials with 9 tulip varieties Lironox-CIPC hlorpropham] applied at 0·8% in April and again in lay reduced weed populations by about 75%. Some ore persistent weed species, however, were not estroyed. The treatment did not injure the tulip aves, nor did it affect flowering, drying of the tops or e propagation coefficient.

228. de Rooy, M.
Kweekbestrijdingsproef met amitrol (= aminotriazol). **(A trial with amitrole for couch grass control.)** *Weekbl. BloembollCult.*, 1965, **76**: 63-4, illus.

mitrole was applied as a spray [rate not stated] to the il 2, 4, 6, 8 or 10 weeks before bulbs (tulips, *Scilla berica* and *Chionodoxa*) were planted in early November. The control of couch grass was initially quite ood, although it was not eliminated by any treatment; istles were cleared, and horsetails (*Equisetum* sp.) ere checked above ground although they recovered ter. All annual weeds were controlled, and the plots mained weed-free for 6 weeks after treatment. hen amitrole was applied 2 weeks before planting, e bulbs were affected; symptoms of injury are desibed for tulips.—Proeft. BloembollCult., Lisse.

229. Kristensen, H. R.
Bekæmpelse af tulipanernes virussygdomme. **(Control of virus diseases of tulips.)** *Gartner Tidende*, 1965, **81**: 287-8, illus.

ymptoms of 4 virus diseases are described. Several eventive and sanitary measures for control are noted, z. planting of healthy stock, roguing, isolation of the op from alternative hosts of tulip viruses, examining il for the presence of nematodes, and effective weed d pest control. [See also *H.A.*, 34: 7103.]

230. de Rooy, M.
Vuurbestrijding bij tulpen. **(Fire control in tulips.)** *Weekbl. BloembollCult.*, 1965, **75**: 1082, 1085.

trials still in progress at Lisse mercury has so far roved superior to other fungicidal dips for bulbs fected with *Botrytis tulipae*, and PCNB soil injections ave been effective for the control of fire in bulbs planted artificially infested soil. For the treatment of growg plants zinc-manganese sprays at ½-¾ normal conntration should be applied weekly, beginning as soon the shoots appear.

231. Bruinsma, J.
Fungicide dithiocarbamaten en de rust van bol- en knolgewassen. **(Fungicidal dithiocarbamates and the resting periods of bulbs and tubers.)** [French, English and German summaries ½ p. each.] *Meded. LandbHogesch. Gent*, 1964, **29**: 965-74, bibl. 16.

he rate of development of the flower primordia in lip bulbs was unaffected by previous applications of rays of various dithiocarbamates or thiuram disulphide for the control of *Botrytis tulipae*. Zineb and maneb applied against *Peronospora destructor* on onions did not affect bulb sprouting, but they prolonged the growing period, and in consequence infection with neck-rot (*Botrytis allii*) increased during storage.—Cent. PlFysiol.-Onderz., Wageningen.

8232. Spomer, L. A., and Langhans, R. W.
Para-dichlorobenzene (moth ball) injury to bulbs. *Bull. N.Y. St. Flower Grs*, 1965, No. 233, pp. 3-4, illus.

Injuries to tulip and hyacinth bulbs in storage were caused by para-dichlorobenzene used instead of naphthalene to deter rodents.

Other bulbs, tubers, etc.

(*See also* 8228, 8232.)

8233. Leighton, F. M.
The genus *Agapanthus* L'Heritier. *J. S. Afr. Bot.*, 1965, Suppl. Vol. **4**, pp. 50, bibls, illus.

A comprehensive monograph covering the history of the genus, its morphology, distribution and cytology, keys to species and individual descriptions of 10 species and their subspecies and forms.

8234. Bosmans, P., and Veldeman, R.
Fysiologie en bestrijding van septoria op anthurium. **(Physiology and control of a *Septoria* sp. on anthurium.)** [French, English and German summaries ½ p. each.] *Meded. LandbHogesch. Gent*, 1964, **29**: 956-63, bibl. 4.

The symptoms are described for infected foliage. The name *Septoria minima* is proposed for the pathogen, which has been previously known as *S. azaleae* or *S. anthurii*. Among several fungicides, tested *in vitro* under different conditions of temperature and humidity, oxyquinoline sulphate gave the best results, inhibiting spore germination completely at concentrations as low as 3 p.p.m.

8235. Gadal, P., and Brunel-Capelle, G.
Variations quantitatives des composés thiols et des acides aminés chez *Arum italicum* Mill. **(Quantitative variations in the thiol compounds and amino acids of *Arum italicum*.)** [English summary ½ p.] *Physiol. vég.*, 1964, **2**: 319-28, bibl. 22.

The leaf blades and inflorescence of *Arum italicum* were rich in thiol compounds, mainly protein thiols; the content varied with the growth stage. The content of glutathione was highest at the time of pollen dispersal. Cysteine was absent. The upper portion of the spadix was characterized by a high concentration of soluble and protein N, of amino acids (mainly alanine and serine +amides), of protein thiols and of glutathione. The principal amino acids found in the vegetative organs were glutamic acid, γ-aminobutyric acid and serine+ amides (except in the leaf blades). Arginine accumulated in the rhizome.—Cent. Physiol. vég., Toulouse.

8236. Lawson, R. H., and Taconis, P. J.
Transfer of dahlia mosaic virus with liquid nitrogen and relation of transfer to symptoms and inclusions. *Phytopathology*, 1965, **55**: 715-18, bibl. 14, illus.

Description of a technique for transmitting the virus to the test plant *Verbesina encelioides*.

8237. Saaltink, G. J., and Maas Geesteranus, H. P.
Een bacterieverwelkingsziekte bij dahlia. **(Bacterial wilt in dahlia.)** [English, German and French summaries ½ p. each.] *Meded. Landb-Hogesch. Gent*, 1964, **29**: 908-16, bibl. 5, illus.

Identification of organism as *Erwinia chrysanthemi* and the symptoms it causes in dahlias.

8238. Tarasova, T. L.
Problems in the introduction of species of the genus *Eremurus* M.B. [Russian, with English summary 8 lines.] *Bot. Žurnal*, 1965, **50**: 647-54, bibl. 18, illus.

A major feature in the evolution of this genus, which is of ornamental and possibly medicinal interest, is considered to be the gradual adoption of a mesophytic habit. The most promising species for introduction in the temperate zone are thought to be members of the section *Eremurus* distributed along the northern border of the recent distribution area and also members of the phylogenetically young section *Henningia*. In the Main Botanic Garden, Moscow, the highest survival rates were shown by *Eremurus regelii* and *E. altaicus* (*Eremurus*) and *E. lactiflorus* and *E. robustus* (*Henningia*).

8239. Kosugi, K., and others.
Nutritional study on freesia. *Tech. Bull. Fac. Hort. Chiba*, 1964, No. 12, pp. 15-20, bibl. 4, illus.

The variety White Mary was grown in sand culture at 4 levels of N and 3 levels each of P and K. Increasing N applications in the presence of P and K increased plant height, number of florets and yields of corms and cormels. Increasing levels of P increased growth, flowering and yields only in the presence of N. Plant responses to K were not significant. The maximum growth, flowering and corm yields were obtained with 100–200 p.p.m. N, 50 p.p.m. P and 60 p.p.m. K.

8240. Heide, O. M.
Blomstringsfysiologiske undersøkelser i freesia. **(Research on flower physiology of freesias.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 306-8, bibl. 7.
Freesia—temperatur, daglengde og blomstring. **(Freesias—temperature, day length and flowering.)** *Gartneryrket*, 1965, **55**: 639-40, 642, 644, bibl. 2, illus.
Freesia—temperatur, daglængde og blomstring. **(Freesias—temperature, day length and flowering.)** *Gartner Tidende*, 1965, **81**: 436-9, illus.

Young Super Freesia plants with 3, 5–6 or 7–8 leaves were grown for 3, 6 or 9 weeks at 12°, 15°, 18° or 21° C. in short or long days. There was no change in the growing point of the youngest plants after 3 weeks' treatment regardless of day length or temperature, but with increasing age and length of treatment the numbers of plants forming flower initials increased. The optimum treatment for flowering consisted of 6 to 8 weeks at 12–15° after the plant had formed 7 to 8 leaves. The production of abnormal flowers ("gladiolus flowers") was favoured by a short period of low temperature (3–4 weeks at 12°) or by temperatures higher than critical for flower formation (e.g. 6 weeks at 18°). In the other 2 papers work on shading the plants in the glasshouse is reported. Shading had a positive effect on total yield and earliness, but more abnormal flowers were produced as a result of the reduced temperature. Short-day treatment (a 9-hour day i summer) had no significant effect on flowering, earlines or flower quality.—Inst. Blomsterdyrk. Veksthusfors Norges LandbrHøgsk., Vollebekk.

8241. Scholz, —.
Anzucht und Verwendung von *Gloriosa roths childiana*. **(Cultivation and use of *Gloriosa roths childiana*.)** *Dtsche Gärtnerbörse*, 1965, **65** 179-82, illus.

A flowering plant can be produced 40 days after plantin a tuber. Forcing is possible from September to April Favourable temperatures are 15–20° C. during the da and 10–15° at night. The R.H. should be high and th soil loamy with a pH value of 6. [See also *H.A.*, 35 1407.]

8242. van Gammeren, J.
De teelt van de gloriosa. **(The culture of gloriosa.** [English summary 6 lines.] *Meded. Dir. Tuinb.* 1965, **28**: 217-24+summary, illus.

Varieties, multiplication and storage of tubers, and crop management including the preparation and packing o flowers for market.

8243. Holmes, F. O.
Elimination of mosaic disease from a clone o *Hippeastrum*. From abstr. in *Phytopathology* 1965, **55**: 504.

A clone of hippeastrum that had remained uniforml affected by mosaic disease during vegetative propaga tion for at least 10 years was transformed into a health clone by the following prodecure. Bulbs were trimme to remove most of their roots and bulb scales, leavin little more than the stem of each bulb. The stems we then cut into sectors and planted in boxes of sand wit their former outer surfaces uppermost. Eventually small bulblets were regenerated on the surface of the cuttings. The bulblets were removed while still smal and planted in 4-inch pots of soil. Out of 92 bulblets thus planted, 36 survived but subsequently showed mosaic symptoms, whereas 5 grew and subsequently produced only healthy-appearing foliage. Two of the healthy-appearing plants have been under observatio for nearly a year. They have produced offset bulbs and their foliage has remained green and free from symptoms. It is believed that these healthy-appearing subclones represent cured plants of the formerly mosaic-infected clone, obtained by excision of small bulblets before they were large enough to have received the causative virus from the parent plants.—Rockefeller Inst., N.Y.

8244. Valášková, E.
Vliv moření na množitelský koeficient hyacint. **(The effect of disinfection on the propagation coefficient of hyacinths.)** [English, Russian and German summaries ⅓ p. each.] *Rostlinná Výroba*, 1965, **11**: 101-10, bibl. 7.

In 4 years' experiments with the hyacinth varieties Innocence and Lady Derby the effect of soaking the bulbs in disinfectants on their subsequent growth was studied. Smaller bulbs, up to 8–10 cm. in circumference, showed a better growth response than larger bulbs, 12–14 cm., which were more sensitive to injury that was conducive to the premature formation of daughter bulbs. Among 35 disinfectants tested bulb growth was promoted most effectively by the organic mercury compounds Germisan and Panogen (0·5% for

5 min.) and by ziram- and zineb-type fungicides (2% or 60 min.). Other materials found suitable were ormalin, TMTD, chloranil, hydroxyquinoline sulphate nd silver nitrate.

245. Franssen, C. J. H., and Mantel, W. P.
Thrips tabaci op hyacintebollen. (***Thrips tabaci*** **on hyacinth bulbs.**) [English abstract 7 lines.] *Neth. J. Plant Path.*, 1965, **71**: 67-71, bibl. 2, illus.

ymptoms are described for infested hyacinth mother ulbs that had been scored at the base and stored in a arkened room in order to induce bulblet production. lmost no bulblets were formed on badly infested bulbs, nd these tended to rot when planted out.—Inst. lZiekt. Onderz., Wageningen.

246. Orsenigo, M.
Sul naturale imbianchimento dei tepali di giacinto in precedenza verdi e sulla irreversibilità dei cloroplasti. (**The natural blanching of originally green perianth leaves of hyacinths and the irreversibility of the chloroplasts.**) [English summary ½ p.] *G. bot. ital.*, 1963 (issued 1964), **70**: 467-75, bibl. 18, illus.

lectron microscope studies showed stages in the egeneration of the chloroplasts, but produced no vidence of any transformation of these into leucoplasts, s the green colour disappeared from hyacinth buds and he perianth turned white during anthesis.

Lawns and sports turf.

(*See also* 6927.)

247. Iisakkila, L.
Perustamme kauniin nurmikon. (**Establishing a lawn.**) *Puutarha*, 1965, No. 4, pp. 208, 210; and No. 5, pp. 273-5, illus.

ncluding species and mixtures for Finland.

248. Roberts, E. C., and Cott, A. E.
A new look at bermudagrass and zoysia for Iowa lawns. *Ia Fm Sci.*, 1965, **19**: 153-5, illus.

ermudagrass and zoysia flourish in Iowa during hot veather, are reasonably disease resistant and withstand lose mowing. Bermudagrass is not as winter-hardy as luegrass, which, however, is slow growing and needs xtra care during establishment. Both bermudagrass nd zoysia have a short growing season, being green for nly 4–5 months in the year. Advice is given on establishing lawns and on the choice of suitable strains for owa.

249. (Burton, G. W.)
A new grass for golfers. *Agric. Res., Wash.*, 1965, **13**(11): 11.

Tifdwarf, a new dwarf form of bermudagrass, was ated equal or superior to Tifgreen as a golf-green grass. t tolerated a $\frac{3}{16}$-inch cutting height better, required less nowing and top-dressing, and showed slightly greater vinter-hardiness and equal disease-resistance.—Ga Coastal Plain Exp. Stat.

250. Lobenstein, C. W.
Sod forming characteristics of Kentucky bluegrass as affected by morphological and physiological factors. *Diss. Abstr.*, 1964, **25**: 3195-6, being *Order No.* 64-12,764 of 122 pp.

bservations on 15 bluegrass clones showed that certain henotypic variants were superior to the standard arieties in their ability to form turf rapidly. This was mainly attributable to the emergence of greater numbers of crowns and to the much greater linear extent of their rhizomes. The average number of emerged shoots per day for growth periods of 120 days or more was 3·4 for the 6 most aggressive clones compared with 1·4 for 5 common varieties. Slow-spreading types generally produced greater numbers of tillers and thus formed denser turfs as they expanded, but sods of the vigorous clones quickly increased in density upon the emergence of new crowns from repeated cycles of new rhizomes. Leaf area measurements and the effects of clipping heights indicated that the most vigorous clones were capable of accumulating carbohydrates and maintaining superior growth with smaller amounts of green leaf tissue than the standard varieties.—Purdue Univ.

8251. Honda, H., and Kusanagi, Y.
Studies on lawn grass for athletic fields. I. Effects of various soil conditioners on the growth and strength of foliage of Japanese lawn grass (Hime-kôrai-shiba). II. On the physical conditions of soils used in the experiment. [Japanese, with English summaries ⅓ p. each.] *Tech. Bull. Fac. Hort. Chiba*, 1964, No. 12, pp. 83-9, bibl. 11, illus.; and pp. 91-7, bibl. 4.

Root formation was extensive in lawns treated with any of 8 soil conditioners, and the resistance to wear was greater than in the untreated controls; aggregation of the soil particles was also improved. Treatment with perlite, sand or sand+perlite+Soiluck gave particularly good results. Erect stems were more resistant to wear than leaves and showed the greatest resistance to breaking on plots treated with perlite+peat moss, Soiluck and Dorogen. A mixture of sand, perlite and Soiluck is recommended for use on sports grounds.

8252. Byrne, T. G., and others.
Vertical mulching for improvement of old golf greens. *Calif. Agric.*, 1965, **19**(5): 12-14, illus.

Vertical mulching (removing 1-in. cores of soil 6 in. deep and filling the holes with sand and organic matter) improved infiltration of the soil in a linear relationship with closeness of spacing. There was no measurable effect on infiltration following the use of a mechanical "aerifier". Neither procedure increased the percentage of bentgrass over *Poa annua*, but the vertical mulching holes provided a good environment for vigorous growth by grass roots.

8253. Watson, E. B.
A controlled-release turf fertiliser. *Park Administ.*, 1965, **30**(6): 49-50.

In 2 trials on turf Nitroform (38% N) gave significantly better results than dried blood and was as good as, or better than, sulphate of ammonia. There was no scorching, and the N was released over a considerable period.—Sports Turf Res. Inst., Bingley.

8254. Goss, R. L.
Nitrogen-potassium team on turfgrasses. *Bett. Crops*, 1965, **49**(2): 34-9.

Tissue analyses and clipping yields were studied to determine the amounts of applied fertilizer elements removed when the grass was cut. The tissue levels of N were highest in the autumn and winter when yields of clippings were lowest; the peak N removal occurred in May and June. The levels of K were highest during the peak of the growing season and lowest in the autumn and winter. N, P and K applied at 522, 77 and 290 lb., respectively, per acre gave the highest total yield of clippings and percentage recovery of N and K. The incidence of fusarium patch disease (*Fusarium nivale*) increased with increased applications of N, particularly in organic or synthetic organic forms. The incidence of *Ophiobolus* patch disease was greatest on plots receiving N alone and least on N+K plots.—Wash. St. Univ.

8255. Willis, A. J.
Methods of weed control and use of growth retarding substances. *Parks*, 1965, **30**: 636, 638, 733-4, 736, 740.

Weed control in turf is discussed, and the results are given of a trial in which a mixed spray containing MH and 2,4-D was applied to roadside verges in Gloucestershire. Recommendations are given for the use of similar mixed sprays, and for the control of weeds under hawthorn hedges.—Univ. Bristol.

8256. Hansen, C. O.
Control of winter annual weeds in southern turf with paraquat. *Abstr. 1964 Mtg Weed Soc. Amer.*, p. 93.

In 2 years' tests in southern States paraquat applied at 1 lb./acre after germination of weeds in late winter or early spring controlled all major annual grasses and broad-leaved species in turf. Of the 4 turf grasses tested only St. Augustine grass was sensitive.—Calif. Chem. Co., Ocoee, Fla.—From *Weed Abstr.*, **14**, No. 90.

8257. Simmons, J., and Huey, R.
The response of Kentucky bluegrass to single and repeat applications of chlordane and polychlorodicyclopentadiene. *Abstr. 1964 Mtg Weed Soc. Amer.*, p. 94.

Neither the first nor the second application of either herbicide, at 4 times the rates needed to control crabgrass, had an adverse effect on either the foliage or roots of the bluegrass.—From *Weed Abstr.*, **14**, No. 91.

8258. Anon.
New crabgrass killer "Tupersan" can be applied when grass is planted. *Du Pont agric. Newsl.*, 1965, **32**(1): 8-9, illus.

Tupersan, a w.p. formulation containing 50% 1-(2-methylcyclohexyl)-3-phenylurea, has given excellent control of crabgrass in turf with no damage to turf grasses even when used at 5–10 times the recommended rate.

8259. Fleming, B. R., and Duich, J. M.
New herbicide promising for crabgrass control. *Science for the Farmer*, 1965, **12**(3): 9, illus.

Complete control of crabgrass in turf was obtained when H-1318 (Tupersan) was applied at 10 lb. a.i./acre to newly seeded areas in mid-May. The germination and emergence of the 4 turf grasses and redtop clover used appeared to be unaffected, and an initial check to their growth disappeared after 3 weeks.

8260. Kreitlow, K. W., and Juska, F. V.
Lawn diseases. How to control them. *Home Gdn Bull. U.S. Dep. Agric.* **61**, revised 1964, pp. 16, illus.

Symptoms and control of 10 fungus diseases, with notes on other causes of poor turf.

8261. Sturgeon, R. V., Jr., Young, H. C., Jr., and Vargas, J. M., Jr.
Control of algae on fine-leaf turfgrasses with a coordination product of zinc ion and maneb. From abstr. in *Phytopathology*, 1965, **55**: 501-2.

Four fungicides, 80% Zn ion+ maneb (Dithane M-45) at 6 oz. per 1,000 sq. ft., 50% Dyrene at 4 oz., a mixture of 75% tetramethylthiuram disulphide+4·5% phenylmercurydimethyldithiocarbamate+17·5% malachite green (Mercuram) at 6 oz. and a mixture of 10% phenylmercuric acetate (Phenmad) at 1 oz.+75% tetramethylthiuram disulphide (Thiramad) at 3 oz., were applied as sprays 19 times at weekly intervals from May to September, 1964, on plots of Seaside bentgrass. All 4 fungicides provided excellent control of brown patch (*Rhizoctonia solani*) and dollar spot (*Sclerotinia homoeocarpa*). However, algal development became severe following moist, hot weather, but it was noted that the plots sprayed with Dithane M-45 were free from algae. Later, during the establishment of plots of Seaside bentgrass and of Tifgreen and Sunturf bermudagrass, algae developed on the plots as a consequence of the almost continuous watering required. A single application of Dithane M-45 at 6 oz. per 1,000 sq. ft. gave complete control. This was the only fungicide tested which provided control of brown patch and dollar spot diseases and controlled algal growth without being phytotoxic.—Okla. St. Univ., Stillwater.

8262. Muse, R. R., and Couch, H. B.
Influence of environment on diseases of turfgrasses. IV. Effect of nutrition and soil moisture on *Corticium* red thread of creeping red fescue. *Phytopathology*, 1965, **55**: 507-10, bibl. 14.

A fuller account of work abstracted in *H.A.*, 34: 5190. [For part III see *H.A.*, 33: 5468.]

8263. Couch, H. B., and Bedford, E. R.
Influence of nutrition and soil moisture on the development of *Fusarium* blight of turfgrasses. From abstr. in *Phytopathology*, 1964, **54**: 890.

With the use of silica sand as the supporting medium, Highland bentgrass (*Agrostis tenuis*), Pennlawn creeping red fescue (*Festuca rubra*) and Merion Kentucky bluegrass (*Poa pratensis*) were grown in containers under different nutrient combinations and levels. The various nutritional regimes were achieved by alteration of the composition of the control basal Hoagland's solution (1·0 H) to provide 0·1 H, 0·1 N, 3·0 N and 0·1 Ca, respectively. Equal amounts of inoculum (1% corn meal-sand cultures of *Fusarium roseum*) were placed on the leaves. During incubation the plants were held in dew cabinets at 85° F. Disease ratings were based on the percentage of blighted foliage per container. Disease development was significantly greater on plants of all 3 turfgrass species grown at either 3·0 N or 0·1 Ca, and significantly less on all 3 species grown at 0·1 N or 0·1 H nutrition. The influence of 3 soil-moisture regimes in the readily available range on the susceptibility of Merion Kentucky bluegrass to 3 isolates of *F. roseum* was studied by gravimetrically established cyclic-irrigation patterns, but no significant difference in disease development was noted.—Pa St. Univ., University Park.

8264. Lukens, R. J.
Control of bluegrass foot-rot disease with a single drench of fungicide. *Phytopathology*, 1965, **55**: 708, bibl. 2.

Several fungicide drenches were tested against *Helminthosporium vagans* on Kentucky bluegrass (*Poa pratensis*). In 1963 Dyrene and Dithane M-45 drenches gave 90% and 93% control, whereas sprays of these compounds gave 67% and 73% control, respectively.

n 1964 a Dyrene drench was effective at a rate of 00 oz. per 1,000 sq. ft. but not at a lower rate. . drench of Dithane M-45 at 100 oz. per 1,000 sq. ft. as not effective in this test.

265. BELL, A. A., AND MUSE, R. R.
The usefulness of tetrachloroisophthalonitrile and tetrachloronitroanisole for control of *Helminthosporium* and rust diseases of Kentucky bluegrass. *Plant Dis. Reptr*, 1965, **49**: 323-6, bibl. 10.

AC 2787 (tetrachloroisophthalonitrile) used as a rotectant (3 oz. a.i. in 5 gal. water per 1,000 sq. ft. of urf applied at 150 lb. pressure) was as effective as ycloheximide-thiram, Dyrene, maneb or Tersan OM pplied in a similar way for the control of *Helmintho-orium* spp. TCNA at 3 oz. a.i. gave only partial ontrol with little residual effect. Both DAC 2787 and CNA gave good control of rust caused by *Puccinia raminis agrostis*; DAC 2787 had a residual action. he dithiocarbamates and cycloheximide-thiram gave quivalent or less good results. Neither DAC 2787 nor CNA was phytotoxic to *Poa pratensis* at the rates used. -Univ. Md, College Park.

266. PEPPER, E. H.
Nematodes associated with melting-out of turfgrass. *Plant Dis. Reptr*, 1965, **49**: 519-21, bibl. 7, illus.

lematodes (*Panagrolaimus* sp.) were repeatedly isolated rom Kentucky bluegrass leaf blades infected by *lelminthosporium vagans*. Leaves containing nema-odes were typically more damaged than leaves infected olely by the fungus. Evidence is presented for a ungus-nematode disease complex.—N. Dak. St. Univ., argo.

267. FILER, T. H., JR.
Damage to turfgrasses caused by cyanogenic compounds produced by *Marasmius oreades*, a fairy ring fungus. *Plant Dis. Reptr*, 1965, **49**: 571-4, bibl. 6.

larasmius oreades produced cyanogenic compounds hat damaged the roots of *Festuca rubra*, *Poa pratensis* nd *Agrostis tenuis*. The production of HCN by the nycelium of *M. oreades* was confirmed.—Southern For. xp. Stat., Stoneville, Miss.

268. LUKENS, R. J.
Urea, an effective treatment for stripe smut on *Poa pratensis*. *Plant Dis. Reptr*, 1965, **49**: 361, bibl. 1.

urf infected with *Ustilago striiformis* and treated with rea at 8 oz. per 1,000 sq. ft. recovered more rapidly han untreated turf.—Conn. agric. Exp. Stat., New laven.

Foliage and succulent plants.

269. KOFLER, L.
Biology and cultivation of *Aloe polyphylla*, the spiral aloe. *J. roy. hort. Soc.*, 1965, **90**: 250-6, illus.

his unusual species, native to Basutoland, is described vith details of its propagation by seed and vegetatively.

270. HERKLOTZ, A.
Über den Einfluss der Lichtintensität auf das Blühen von Aphelandra "Fritz Prinsler". **(The effect of light intensity on flowering of aphelandra "Fritz Prinsler".)** [English and French summaries ½ p. each.] *Gartenbauwiss.*, 1965, **30**: 107-13, bibl. 5, illus.

Young plants growing at 24–27° C. were exposed to light intensities of 1,000–9,000 lux for 4–20 hours daily over periods of 40–80 days. In a further trial the effects were compared of 20–22° and 25–27° at different light intensities and photoperiods. Plants grown at 1,000 lux for 20 hours a day and at 2,000 lux for 9 hours continued to make only vegetative growth even after 6 months. The greatest number of flowers and the least number of new leaves were produced after exposure to 9,000 lux for 20 hours a day. Flowers formed after plants had received 2,000 lux for 12 hours a day, and there appeared to be a critical daily light dose below which flower formation did not occur. Higher temperatures promoted growth and flower development but did not alter the light threshold for flower induction.—Tech. Hochsch. Hannover.

8271. ERIKSEN, E. K.
IV. Sektionsforsøg. A. *Asparagus plumosus*-sektionen. **(IV. Sectional experiments. A. The *Asparagus plumosus* section.)** *Årbog Gartneri, 1964*, [1965], **46**: 116-27.

Several cultural trials are reported. In the first year of trials at Blangstedgaard increases in N levels increased the yield of asparagus "fern", but the highest levels of K reduced yields. With supplementary CO_2 the increases in yield were not consistent throughout the year, although the total yields of both a young and an older crop were increased with CO_2, the response of the young crop being greater. In a spacing trial 60 plants per sq. m. was the maximum desirable density; at a given density yields from 1-year-old and 2-year-old plants were similar, but the quality of "fern" from the 2-year-old plants was better. There was little difference in yields from untreated plants and plants given supplementary lighting, but with 24 hours' lighting per day many shoots without side branches were produced. In other trials quality was reduced by extra lighting. A comparison of yields from crops raised from relatively large and small plants of the same age showed an advantage from using larger plants. [For earlier work see *H.A.*, 33: 7604.]

8272. (CATHEY, H. M.)
Apples cause flowering in common houseplant that rarely blooms. *Agric. Res., Wash.*, 1965, 13(10): 7.

Flowering was induced in bromeliads by enclosing a ripe apple in a plastic bag with the plant for 4 days. Flowers and fruits were produced 1 to 6 months later, depending on the species.

8273. DE CLERCQ, R., AND HEUNGENS, A.
Voorkomen van *Rhizoecus cacticans* Hambleton in de sierplantenteelt. **(The occurrence of *Rhizoecus cacticans* in ornamental plant growing.)** [French, English and German summaries ⅓ p. each.] *Meded. LandbHogesch. Gent*, 1964, **29**: 1097-1109, bibl. 3, illus.

This mealy bug has recently been found causing extensive root damage on bromeliads. Sixteen species, including those of *Aechmea*, *Neoregelia* and *Vriesea*, were examined, and of these only *N. carolinae* was not infested. Members of the Cactaceae and Araliaceae were also attacked. Drenching plants with a persistent systemic insecticide such as Metasystox gave good control.

8274. Coïc, Y., Lesaint, C., and Provot, M.
L'incorporation à l'obscurité, à la lumière et à des temps différents de $^{14}CO_2$ dans les acides organiques des feuilles de *Bryophylium daigremontianum*. Influence de la température. **(The incorporation of $^{14}CO_2$ into the organic acids of the leaves of *Bryophyllum daigremontianum* in darkness and in light and at different times of day. The influence of temperature.)** [English summary ⅓ p.] *Ann. Physiol. vég.*, 1965, **7**: 47-56, bibl. 9.

Labelled CO_2 was incorporated into the leaves for 30 minutes at different times in the diurnal cycle and in the presence of artificial light. The effect of temperature was studied after nightfall by incorporation at 13° and 26° C. The fumaric acid content, unlike that of the other acids, was increased in light and reduced with rising temperatures. C^{14} incorporation was greatest in malic acid, much less in citric acid and slight in isocitric acid. It occurred most markedly after nightfall, less so before dawn and least in full daylight. The experimental use of artificial light or darkness had little effect on this rhythm, although during the normal night period both the overall incorporation of C^{14} and its distribution in the different acids varied widely. The metabolisms of malic, citric and fumaric acids (strong specific radioactivity) and succinic and isocitric acids (weak specific radioactivity) are discussed. [See also *H.A.*, 35: 6147.]—Cent. nat. Rech. agron., Versailles.

8275. Joussaume, M., and Bourdu, R.
Les acides nucléiques des fractions chloroplastiques isolées de feuilles de *Bryophyllum daigremontianum* Berger. **(The nucleic acids of the chloroplast fractions isolated from the leaves of *Bryophyllum daigremontianum*.)** [English summary 9 lines.] *Physiol. vég.*, 1964, **2**: 329-39, bibl. 26, illus.

8276. Marcelle, R., and Sironval, C.
Action du phosfon D et de la gibbérelline sur la croissance et la floraison de *Bryophyllum tubiflorum* Harv. **(The action of Phosfon D and gibberellin on the growth and flowering of *Bryophyllum tubiflorum*.)** [English summary 8 lines.] *Physiol. vég.*, 1964, **2**: 409-18, bibl. 9, illus.

When applied under short-day conditions GA_3 induced flowering in bryophyllum; the plants flowered sooner, and had more flowers per inflorescence, with an application rate of 20 µg. per plant than with one of 10 µg. Phosfon, incorporated in the potting soil at the start of the experiment, greatly reduced the effect of GA. When GA was applied under natural long-day conditions it increased the amount of flowering induced by the gradual transition to natural short days. Phosfon applied during the long-day period inhibited flowering in the subsequent short days and reduced the favourable effects of GA. A study of the effects of GA on stem growth, leaf number and flower induction indicated that the growth substance has a selective action on the different meristematic zones, and that this action varies with the photoperiodic treatment.—Cent. Rech. Gorsem, St.-Trond.

8277. Catarino, F. M.
Some effects of kinetin on sex expression in *Bryophyllum crenatum* Bak. (LSDP). *Portugal. Acta biol.*, 1964, **8**: 267-84, bibl. 26, illus.

Spraying with 50 p.p.m. kinetin solution at intervals caused a shift in the sex balance of the inflorescences towards femaleness, apparently through a direct and localized effect. The treatment increased the size of the flowering shoots and bracts and the number of flowers. Changes in the flower varied with the stage which the primordia had reached at the time of treatment but were always in a vegetative direction. In general, development of the calyx and gynoecium was stimulated, whereas that of the corolla and androecium was inhibited. These results are discussed.—Inst. bot., Univ. Lisboa.

8278. Zimmer, K.
Beeinflussung der Blüte bei Bromelien. **(Flower induction in bromeliads.)** *Gartenwelt*, 1965, **65**: 35-7, 56-8, bibl. 10, illus.

Guzmania monostachya plants were treated with acetylene (50 g. calcium carbide in 10 l. water) from early March to mid-May. The inflorescences took 6–7 weeks to develop, the plants then being in full leaf. Similar work on *Vriesia splendens* is also reported [see *H.A.*, 35: 6157 and 6158].—Tech. Hochsch. Hannover.

8279. Hirata, F.
The grafting of young seedlings on *Hylocereus guatemalensis*. *Nat. Cactus Succ. J.*, 1965, **20**: 20-1, illus.

Seedlings of various types of cactus can be used as scions if grafted when only 3 days to 1 month old.

8280. van de Laar, H. J.
Het *Hedera helix*-sortiment in de bloemisterij. **(The ivy varieties in floriculture.)** *Vakbl. Bloemist.*, 1965, **20**: 536-7, 590-1, illus.

Forty-two decorative varieties of *Hedera helix* are listed with their synonyms, 23 being described in detail.

8281. Goldman, R.
Growth retardants on English ivy. *Maryland Flor.*, 1965, No. 116, pp. 1-2.

Plants of the *Hedera helix* cultivar Green Ripples were treated with B-Nine or Cycocel, both at 1% and 0·5%, or with Phosfon as a soil drench at 60 ml. per 4-in. pot. B-Nine was the only compound that retarded shoot growth and the effects continued for more than 4 months after treatment. Plants treated with 1% Cycocel showed some leaf burn.

8282. Anon.
Zur Kultur der Kalanchoe "Schweizer Hybriden". **(The culture of the kalanchoe "Swiss hybrids".)** *Dtsche Gärtnerbörse*, 1965, **65**: 321-2, illus.

Characteristics are tabulated of the varieties Melody, Morgensonne, Ramona, Rotglut and Exotica. Four important points in their cultivation (viz. repeated pinching out, shading, the removal of the first bud after shading and the provision of supplementary light) are briefly discussed.

8283. Zabka, G. G., and McMahon, E.
Relationships among CO_2 dark-fixation, succulence, flowering, and organic acid formation in *Kalanchoe blossfeldiana* variety Tom Thumb. *Canad. J. Bot.*, 1965, **43**: 447-52, bibl. 14.

It was found that flowering, succulence, organic acid formation, leaf thickening and the capacity for CO_2 dark-fixation were all under photoperiodic control and increased with increasing numbers of short-day treatments. They also occurred in a CO_2-free atmosphere on 9-hour photoperiods, although after 5 weeks CO_2

dark-fixation and organic acid formation were limited to the low level of the long-day treated plants. Only CO_2 dark-fixation and organic acid formation appeared to be interrelated and apparently utilized respiratory CO_2 in a CO_2-free atmosphere. This capacity to use respiratory CO_2 increased with plant maturity. Flowering did not control the development of succulence, organic acid formation or the capacity for CO_2 dark-fixation. Likewise the capacity for dark-fixation and organic acid formation did not control flowering and could occur in vegetative plants not exhibiting appreciable succulence. [From authors' abstract.]—Ohio St. Univ., Columbus.

8284. Springer, E.
Die Kultur von *Monstera deliciosa* in Torf unterschiedlicher Körnung. **(The culture of *Monstera deliciosa* in peats of different particle sizes.)** *Torfnachrichten*, 1965, **16**: 3-4, illus.

Monstera deliciosa plants were grown in peats of 4 particle sizes (1–5, 1–15, 1–30 mm. and very fine particles all under 1 mm.). Plants in the fine peat were taller, with more shoots and leaves, than in other grades. No differences in leaf number were observed between the other peats.

8285. Seibold, H.
Schöne Kleinblattpflanzen: Peperomien. **(Beautiful small-leaved plants: peperomias.)** *Zierpflanzenbau*, 1965, **5**: 427-9, illus.

Notes on 22 varieties with many illustrations.

8286. Gold, —.
De dyrkede *Philodendron*. **(Cultivated philodendrons.)** *Gartner Tidende*, 1965, **81**: 273-6, illus.

Brief notes on 39 species.

Orchids.

8287. (Allen, P. H.)
A check list of orchids of El Salvador. *Amer. Orchid Soc. Bull.*, 1965, **34**: 625-31, illus.

8288. Hall, A. V.
Studies of the South African species of *Eulophia*. *J. S. Afr. Bot.*, 1965, Suppl. Vol. **5**, pp. 248, bibls, illus.

This comprehensive monograph, which is concerned with the revised taxonomy of the orchid genus *Eulophia*, is divided into 4 parts dealing with: the classification of aggregates; the correlations between taxa; a key for the identification of taxa; and descriptions and nomenclature of species, subspecies and varieties. Thirty-six species of *Eulophia* occur in South Africa, and the monograph is chiefly concerned with these. *Lissochilus* and *Eulophia* are here regarded as a single genus.

8289. Post, R. E., Jr.
Blooming characteristics of *Cattleya* species. *Amer. Orchid Soc. Bull.*, 1965, **34**: 593-6.

Tables are presented showing flower characteristics of 16 *Cattleya* species, and also the vegetative and flowering cycles of the *warscewiczii* and *mossiae* "groups" and of *Brassocattleya* hybrids.

8290. Poddubnaja-Arnol'di, V. A.
Comparative embryological studies in representatives of the Orchidaceae. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 54, pp. 51-62, bibl. 12, illus.

In species of *Calanthe*, *Cattleya*, *Cypripedium* and *Dendrobium*.

8291. Cinger, N. V., and others.
The evolution of the female embryonal organs in the Compositae and Orchidaceae. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 55, pp. 81-90, bibl. 4, illus.

The material studied comprised 3 species of *Taraxacum* and one each of *Cypripedium*, *Dendrobium* and *Calanthe*.

8292. Kotomori, S., and Murashige, T.
Some aspects of aseptic propagation of orchids. *Amer. Orchid Soc. Bull.*, 1965, **34**: 484-9, bibl. 5, illus.

When coconut milk was added to the germination medium it did not appear to affect the rate of germination of dendrobium seeds but inhibited subsequent development. When it was supplied to 1-year-old seedlings it stimulated growth. Lowering the pH from 5 to 4·8 or 4·6 doubled the growth rate of seedlings. Seedling growth was also stimulated when the agar concentration was reduced from 1·4 to 0·6%. Dormant lateral buds taken from phalaenopsis flower stems were successfully cultured on agar to which coconut milk was added at 15% by volume. After 3 months the leaves and roots were fully developed and the plants could be potted up.

8293. Urata, U., and Iwanaga, E. T.
The use of Ito-type vials for vegetative propagation of phalaenopsis. *Amer. Orchid Soc. Bull.*, 1965, **34**: 410-13, bibl. 8, illus.

Sections of the basal stem of various *Phalaenopsis* spp., each including a single node, were treated with a chemical sterilant before being inserted through a rubber seal into a vial containing a nutrient solution. The vial, resembling that devised by R. Ito [*Jap. Orchid Soc. Bull.*, 1958, **4**: 14-15], is described and illustrated. The portion bearing the node remained outside the vial. In about half of the 300 sections so treated a flowering stem rather than a vegetative bud developed, generally from the upper basal nodes. If the upper part of the flower stem was removed, a vegetative bud usually developed from one of the remaining nodes. Pink flowered plants descended from *P. schilleriana* and *P. sanderiana* were difficult to propagate by this method, whereas all white and spotted pink varieties responded well.

8294. Halpin, J. E., and Farrar, M. D.
The effect of four different fluorescent light sources on the growth of orchid seedlings. *Amer. Orchid Soc. Bull.*, 1965, **34**: 416-20, bibl. 4, illus.

The 4 light sources tested were Cool White, Warm White, Standard Gro-Lux and Wide-Spectrum Gro-Lux. Seedlings of 5 different breeding lines were grown in 16-hour days under 40-watt lamps for 8 months. A substantially higher percentage of seedlings survived when grown under Wide-Spectrum Gro-Lux lamps than under the other types. Certain genetic lines grew more rapidly than others, but larger plants were produced under the 2 Gro-Lux lamps The light source seemed to have no effect on plant colour. In another experiment young seedlings of one hybrid were grown in agar in milk bottles under the 4 types of lamp for 6 months; those grown under the 2 Gro-Lux lamps appeared to be larger and more robust than the others. The Wide-Spectrum lamp emitted a relatively high proportion of its light in the blue and red portions of the visible spectrum. Of the light sources tested Cool White gave the poorest results.—Clemson Univ., S.C.

8295. Adderley, L.
Two species of moss as culture medium for orchids. *Gdn J. N.Y. bot. Gdn*, 1965, **15**: 105-6, 120, illus.

Thuidium delicatulum and *Hypnum imponens* have proved suitable substitutes for osmunda fibre for a wide range of orchids. Liming proved necessary for *Paphiopedilum* spp.; the pH of both mosses was between 3·5 and 4·5.

8296. Bivins, J. L., and Kofranek, A. M.
Chemical weed control in cymbidium beds and pots. *Amer. Orchid Soc. Bull.*, 1965, **34**: 397-8, bibl. 2.

Excellent control of annual weeds, algae and moss was obtained by using Kloben at 1·46 and 2·9 oz. a.i. (50% w.p. or 2% granules for the higher rate) and simazine at 0·73 oz. a.i. (80% w.p.) per 1,000 sq. ft. No phytotoxicity was observed and weed control lasted for up to a year after application.—Univ. Calif., Los Angeles.

8297. Kado, C. I., and Jensen, D. D.
Cymbidium mosaic virus in phalaenopsis. *Phytopathology*, 1964, **54**: 974-7, bibl. 15, illus.

The disease caused by cymbidium mosaic virus (CMV) is characterized by mosaic symptoms, chlorotic or necrotic spots, rings and irregular lesions, some of which become water-soaked. Lesions on the lower leaf surfaces often collapse and become depressed or furrowed. Severely affected leaves are killed. Conspicuous symptoms appeared in phalaenopsis within 15–26 days after inoculation. The virus was mechanically transmitted from phalaenopsis to various other plants. The virus was recovered from experimentally infected leaves and from naturally infected leaves, flowers, pollen grains and roots of phalaenopsis.—Univ. Calif., Berkeley.

8298. Freytag, A. H.
A "hot knife" to prevent virus spread in orchids. *Amer. Orchid Soc. Bull.*, 1965, **34**: 501-2, illus.

The construction is described of a serrated knife blade formed from piping connected to a small propane burner, which heats it while it is being used for cutting flower spikes.

Conifers.

8299. De Maeseneer, J.
De betekenis van vrijlevende wortelaaltjes bij het wortelrot van coniferen. **(The influence of free-living nematodes on root rot of conifers.)** [French, English and German summaries ⅓ p. each.] *Meded. LandbHogesch. Gent*, 1964, **29**: 797-809, bibl. 8, illus.

Pratylenchus penetrans and *Rotylenchus uniformis* are widely distributed in Belgian conifer nurseries. In pot trials with *Chamaecyparis lawsoniana* plant growth was limited by the number of *P. penetrans* in the soil. The root systems of infested plants were much reduced, with lesions and many dead root tips. Aerial parts of the plant were normal though smaller than those of controls. Although 2 species of pathogenic fungi were found in association with infested plants, the nematodes (*P. penetrans* in particular) proved to be the primary pathogens. Fungicide treatment with TMTD did not reduce plant damage.

8300. Hayashi, T.
Fundamental studies on the sugi tree (*Cryptomeria japonica* D. Don.) raised from seedlings from different regions of Japan. I. On the growth of sugi trees raised from seedlings. II. On rooting of cuttings and their growth. III. On the status of flowering of sugi trees raised from seedlings. [Japanese, with English summaries ½ p. each.] *Bull. Fac. Agric. Miyazaki*, 1964, **10**: 41-60, bibl. 29; 1965, **10**: 253-79, bibl. 8, illus.; and 280-94, bibl. 6.

Part I: In 35 strains of sugi seedlings from different parts of Japan the period of maximum growth usually occurred in June. A few strains showed 2 growth peaks in the first year, and some northern strains reached a growth peak in months other than June in the first year. Northern strains generally grew better than southern. *Part II*: The rooting of cuttings and their rate of growth varied according to the strain of the parent tree. *Part III*: More than 60% of the 7- and 8-year-old trees flowered and more than half of them produced female flowers. Only a few trees produced male flowers, which were present in either very large or very small numbers. Most of the trees bearing only female flowers produced very few flowers, as did trees producing both male and female flowers. The mean height of flowering trees was greater than that of trees with no flowers. About 78% of the trees resembled their parents in the tendency to flower or not to flower.

8301. Peterson, G. W., Sumner, D. R., and Norman, C.
Control of *Phomopsis* blight of eastern red-cedar seedlings. *Plant Dis. Reptr*, 1965, **49**: 529-31, bibl. 3.

In a trial of 4 fungicides 7·5% phenylmercuritriethanolammonium lactate (PAS) gave good control of *Phomopsis juniperovora* when applied to 1- and 2-year-old seedlings of *Juniperus virginiana* at 1, 1½ or 2 pt./100 gal. water. Control was not improved by the addition of 2 spreader-stickers to PAS. When PAS was applied to 2-year-old seedlings they became slightly lighter in colour.—Neb. agric. Exp. Stat.

8302. Bulard, C., and Degivry, M.-T.
La dormance des graines de *Pinus coulteri* Don.: mise en évidence et essai de localisation. **(Seed dormancy in *P. coulteri*: demonstration and location trial.)** [English summary 10 lines.] *Phyton, Argentina*, 1965, **22**: 55-60, bibl. 17, illus.

A high percentage of the seeds of several samples of *Pinus coulteri* showed a dormancy of the psychrolabile type [i.e. liable to change at low temperatures]. A comparison between the results obtained from embryo culture and from aseptic germination tests on seeds deprived of their integuments showed that the inhibitory factor was located not only in the embryo itself, but also in the endosperm and the papery membrane. A certain heterogeneity was observed in the behaviour of the seeds of the same sample. [From authors' summary.] —Fac. Sci., Dijon.

8303. Brown, J. H.
Effect of time of summer pruning on bud set, limb development, and shoot growth of sheared pines. *Bull. W. Va Univ. agric. Exp. Stat.* **498**, 1964, pp. 33, bibl. 13, illus.

Trees of *Pinus sylvestris*, *P. resinosa* and *P. strobus* for Christmas tree production were pruned at 6 different times during the summer months over a 6-year period. On *P. sylvestris* and *P. resinosa* most buds were formed after mid-June pruning, whereas an early July treatment was best for *P. strobus*; in all cases later pruning resulted in fewer buds being formed. With *P. sylvestris* more buds developed on trimmed stems, at all times, than on unpruned controls, but with *P. resinosa* and *P. strobus* only those trees pruned in June or July formed more buds than the controls. Limb development followed a similar pattern, with the exception of late-pruned *P. resinosa* which formed additional limbs originating from buds formed during the spring after pruning. On *P. sylvestris* the most effective limbs (i.e. those contributing to tree density) were formed after early June pruning, and the number decreased with later pruning; pruned trees always formed more limbs than the controls. With *P. strobus* the numbers of effective limbs on both early-pruned and unpruned trees were very similar; pruning from mid-July onwards reduced the number. With all 3 species the maximum shoot growth occurred on stems pruned in early June; later pruning reduced shoot development. Unpruned trees always formed more shoots than pruned trees. The level on the tree at which pruning was carried out influenced growth; pruning the terminal shoot resulted in the maximum bud formation, limb development and shoot growth, whereas the minimum development took place when the third whorl (the lowest investigated) was pruned. The initial pruning had more effect than subsequent ones on the same trees. In all species the ratio of the length of new needles on developing shoots to the length of old needles on the previous year's terminal was a reliable indicator of early-season growth patterns (which could affect the results of pruning).

8304. TUKEY, H. B., AND MEYER, M. M., JR.
Nutrient applications to dormant plants. *Amer. Nurserym.*, 1965, **121**(11): 7-8, illus.

Root growth of dormant yew and forsythia plants was considerable at a soil temperature of 45° F., slight at 40° and almost nil at 35°. The application of nutrients resulted in much greater root growth at all 3 temperatures. N, P and K were absorbed throughout the winter from unfrozen soil and translocated into the tops, and were used in making increased growth the following spring.—Cornell Univ., Ithaca, N.Y.

8305. BART, G. J.
***Pythium* root rot of *Taxus*.** From abstr. in *Phytopathology*, 1964, **54**: 887.

Pathogenicity of, and symptoms caused by, an unidentified *Pythium* sp. on *T. capitata* and *T. brownii*.

8306. MILLER, P. M., AND AHRENS, J. F.
Effect of an herbicide, a nematocide, and a fungicide on *Rhizoctonia* infestation of *Taxus*. From abstr. in *Phytopathology*, 1964, **54**: 901.

Of 3 different types of pesticide applied in 1962, 2 still influenced *Rhizoctonia* infestation of *Taxus* in 1964. The herbicide simazine was sprayed on the soil surface at 8 lb./acre in May, 5 days after the planting of *Taxus*. The nematicide DBCP was injected into the soil at ·5 gal./acre. The fungicide Panogen Turf Spray (2·2% methylmercury dicyandiamide) was watered on the soil at 6·5 gal./acre and worked in to a depth of 3 in. The latter 2 treatments were applied 3 weeks before planting. Simazine reduced *Rhizoctonia* infestation by 0% and 75% in 1962, 50% in 1963 and 40% in 1964. This effect must have been indirect, because growth of *R. solani* on agar was reduced very slightly by 500 p.p.m. of simazine, over 10 times that applied to the soil. DBCP reduced infestation by 40% and 78% in 1962 but had no effect in subsequent years. Panogen Turf Spray actually increased infestation by 40% and 55% in 1962, 20% in 1963 and 113% in 1964.—Conn. agric. Exp. Stat., New Haven.

Poinsettias.

(*See also* 8102, 8144.)

8307. SHANKS, J. B.
Recent poinsettia research—some observations for future trials. *Maryland Flor.*, 1965, No. 118, pp. 1-6.

Stock plants of the variety Indianapolis Red were grown from 15 May to 15 June at 62° and 70° F. for cutting production; 12% of the plants grown at 70° developed severe "curly-leaf" symptoms, whereas those grown at 62° were unaffected. Plants grown on in a shaded greenhouse after the temperature treatments had ceased produced more cuttings than if shade was omitted, but these cuttings were more difficult to root. In a further trial stock plants were grown at 62° and later moved to shaded or unshaded houses (the latter having either full or minimum ventilation). Cuttings taken from plants of Indianapolis Red in the unshaded and inadequately ventilated house showed the poorest rooting, whereas those of the variety Paul Mikkelsen rooted well. The effects of pot size (10 in., 8 in. and 6 in.) on cutting production were investigated for young stock plants. Paul Mikkelsen plants grown in 10-in. pots produced an average of 51 cuttings compared with 47 in 8-in. pots and 33 in 6-in. pots. Cutting production from young plants of Indianapolis Red was better for plants grown in 8-in. pots than when 6-in. or 7-in. pots were used. The yield of cuttings per 8-in. pot was increased, but the yield per plant was reduced, if the number of plants per pot was increased from 1 to 3. Combinations of the following treatments were applied to Paul Mikkelsen cuttings in 6-in. pots: 62° or 70° F. night temperature, normal or interrupted (2 hours' light) nights, no drench or a 1·5% Cycocel drench. At the higher temperature stems and bracts were longer and flowering was forwarded. "Flower splitting" (excessive elongation of the inflorescence branches) was increased at the higher temperature and when additional lighting was applied at night; it was most pronounced when these treatments were combined. Following Cycocel drenching plant height was reduced from an average of 26·9 cm. to 19·8 cm., and bract length was also slightly reduced. Flowering was delayed in plants subjected to low light intensity (20% or 60% of full light) and this was more pronounced at 62° than at 70°. Cuttings taken from illuminated stock plants in mid- or late December made very slow growth during January-February at 68° even with additional lighting, and short-day treatment from March was required to obtain flowering plants by April. B-Nine sprays at 0·25%, 0·5% and 1% and Cycocel at 0·25% (spray) and at 0·125%, 0·25% and 0·5% (drench) were applied to young plants a month after rooting. The length of internodes was most reduced following 0·5% Cycocel drenching; sprays of Cycocel proved phytotoxic. B-Nine sprays were not phytotoxic but were less effective. [For earlier work see *H.A.*, 34: 3265.]

8308. SHIMADA, T., AND MIYAZAKI, S.
Effect of GB [gibberellin] treatments on photoperiodically induced poinsettia plants. Photoperiodic reactions in poinsettias III. [Japanese, with English summary ½ p.] *Agric. Bull. Saga Univ.*, 1964, No. 20, pp. 1-29, bibl. 37, illus.

Plants of *Poinsettia pulcherrima*, which had been grown under 10 or 16 short days with and without spray applications of gibberellin at 10 p.p.m. on alternate days, were transferred to long-day conditions. All plants treated with 10 short days+gibberellin remained vegetative. Control plants grown under short days without gibberellin reverted from the reproductive to the vegetative phase, as did plants treated with gibberellin during the first 10 or the last 6 days of the 16-short-days treatment. Two out of every 3 plants sprayed 8 times throughout the 16-short-days treatment reverted to or remained in the vegetative phase. The reversal of plants sprayed with gibberellin during the first 10 days or throughout the 16 short days was more rapid than that of the controls. Plants sprayed during a last 6 days of the period, however, reverted at a rate similar to that of the controls. [For part II see *H.A.*, 35: 6171.]

Rhododendrons and azaleas.

8309. DUBROVICKAJA, N. I., AND FURST, G. G.
On the propagation by cuttings and the pruning of azaleas under glasshouse conditions. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 54, pp. 39-43, bibl. 8, illus.

Softwood cuttings taken in the middle of April from 1½-month-old shoots of *Rhododendron indicum* var. Ernst Thiers did not root, whereas cuttings taken at the end of June from 3–4-month-old shoots showed 90–100% rooting. Anatomical investigations showed that the 3–4-month-old shoots had a fairly lignified xylem, and that root meristems were subsequently initiated in the cambial zone of the vascular bundles. Tipping some of the shoots in the summer delayed flower bud initiation, which retarded flowering on these pruned shoots and prolonged the flowering period of the plants by 3–4 weeks.

8310. SOUKUP, J.
Vliv některých organických a minerálních substrátů na vzrůst rhododendronu "Cunningham's White". **(The effect of some organic and mineral substrates on the growth of the rhododendron Cunningham's White.)** [English, Russian and German summaries 1¼ pp. each.] *Acta průhoniciana*, 1964, No. 10, pp. 21-38, bibl. 6, illus.

The use of 4 horticultural organic soils, 3 mainly mineral soils and of sawdust and wood shavings was studied for growing rooted rhododendron cuttings for 6 years in the nursery and for the next 5 years in their permanent positions. For the nursery the most suitable substrates were those containing a high proportion of peat or moorland soil; these are light and have a high water-holding capacity and favourable reaction (pH 3·5–5·0). Growth was best in 75% coarse fibrous peat+25% sand, and was also very good in 30% peat+30% moor soil+30% leaf mould+10% sand, supplemented with fertilizers. Mineral soils were not suitable for nursery plants. In the permanent sites rhododendrons again grew best in peat substrates and also very well in 50% arable mineral soil+50% peat or pine litter. Less vigorous but still satisfactory growth was obtained in 50% mineral soil+50% sawdust enriched with fertilizers. The pH value of the arable soil-sawdust mixtures was adjusted by adding 0·2% H_3PO_4. These results show that, provided the soil reaction is adjusted, sawdust can replace peat or pine litter for growing rhododendrons.

8311. CRITTENDON, C., KIPLINGER, D. C., AND MILLER, R. O.
The use of growth retardants, B-Nine and Cycocel, on several azalea varieties during 1964-1965. *Ohio Flor. Ass. Bull.*, 1965, No. 429, pp. 3-4.

Three treatments—no spray (control), B-Nine at 0·15% and Cycocel at 2½ oz./gal.—were applied twice in July to azalea plants of 47 varieties. The plants were brought into a heated glasshouse in early December and forced as usual. The treatments resulted in more compact growth. Flowering was slightly delayed in nearly all the varieties by the spray treatments, although flower bud initiation was earlier and more uniform, and a greater number of flowers developed. [For earlier work see *H.A.*, 34: 7165.]—Ohio agric. Exp. Stat., Wooster.

8312. LAVSEN, E. R.
Klumpblad på azalea. **(*Exobasidium japonicum* on azaleas.)** *Gartner Tidende*, 1965, **81**: 327, illus.

The fungus attacks dormant buds and young leaves up to 8–10 mm. long. Symptoms are described and varietal susceptibility is noted. Removal and burning of all infected shoots and leaves and the use of healthy mother plants are the recommended methods for controlling infection.

8313. BARKER, K. R., AND WORF, G.
Parasitism of "southern stock" azaleas in Wisconsin by *Tylenchorhynchus claytoni, Trichodorus christiei,* and *Meloidogyne incognita.* From abstr. in *Phytopathology*, 1964, **54**: 887.

Tylenchorhynchus claytoni was most prevalent and apparently most damaging to the azaleas. *Trichodorus christiei* was observed only during the autumn and early spring. *Meloidogyne incognita*, which was found in one location, reproduced readily on azalea, but induced little or no gall formation. Locally propagated stock showing decline was infested primarily with *T. claytoni* and a few *T. christiei*, which apparently resulted from introducing infested plants. Hand-picked *T. claytoni* (200–500/pot) reproduced rapidly, as well as greatly reducing the root growth of Madame Pericat azaleas and inducing foliage decline over 4 months. Mass inoculations (200–1,000/pot) resulted in less injury and a much lower rate of reproduction of *T. claytoni.* Established Whitewater White azaleas that received normal or no Hoagland's nutrient solution were moderately injured by mass inoculations (1,000/pot) of *T. claytoni.* Excessive nutrients injured the plants severely, but no synergistic response was evident. [See also *H.A.*, 35: 6182.]—Univ. Wis., Madison.

8314. HEUNGENS, A., AND DE CLERCQ, R.
Bestrijding van regenwormen in sparregrond. **(Control of earthworms in spruce litter.)** [French, English and German summaries ¼ p. each.] *Meded. LandbHogesch. Gent*, 1964, **29**: 1128-38, bibl. 9.

Poor growth made by *Azalea indica* plants growing in spruce litter under glass was associated with a high population of the earthworm *Dendrobaena octaedra.*

The nematicides Basamid, Vapam and DD controlled the worms satisfactorily without being phytotoxic, but several insecticides had no effect. The percentage kill obtained was influenced by worm size.

Roses.

(*See also* 6926, 6938, 6982, 7017, 8117, 8329.)

8315. Kallio, T. K., Lenander, S.-E., and Lundstad, A.
Symposiet rosor. **(A rose symposium.)** *Nord. JordbrForsk.*, 1964, Suppl. 8, pp. 328-39.

Three speakers contributed to the symposium as follows: T. K. Kallio ("On rose variety trials in Finland") discussed the characteristics flower number, disease resistance and winter hardiness; S.-E. Lenander ("Experiences from trials with rose rootstocks") described results of Swedish work with 20 rootstocks, the hardiest of these being *Rosa alpina*, *R. poppius* and *R. rubrifolia*; A. Lundstad ("Garden roses in Norway") spoke on the behaviour of different varieties and rootstocks and on planting dates, pruning, mulching and breeding.

8316. Lundstad, A.
Experiments with the New Dawn climber rose of various origin. [Norwegian summary 1 p.] *Meld. Norg. LandbrHøgsk.*, 1965, **44**(8): 1-7, bibl. 3.

Budwood of the climbing rose New Dawn was taken from (a) plants without flowers; (b) shoots bearing flowers, and (c) shoots without flowers, taken from flowering plants. The rootstock was *Rosa multiflora*. The plants grown from source (b) were much shorter than the others and produced fewer lateral shoots; they were the only plants to flower while still in the nursery. When mature they also flowered much more profusely than the other 2 types and remained shorter. Plants grown from source (a) had fewer thorns per metre of shoot and their flowers contained more petals than those of the plants from sources (b) and (c).

8317. Van Hulle, J.
Onderzoek op rozenonderstammen. **(Research on rose rootstocks.)** *Meded. BedrVoorlicht. Oost-Vlaanderen* **29**, 1965, pp. 3.

Rootstocks studied in 1963-64 were: *Rosa canina* Heinsohn's Rekord, *R.c.* Succes, *R.c.* Inermis, *R.c.* Pfänder, *R.c.* Schmid's Ideal, *R.c.* Pollmeriana, *R.c.* Bröggs, *R. laxa*, *R. multiflora* and *R. rubiginosa*. They were classified according to vigour, susceptibility to infection, percentage success in budding with 5 scion varieties, liability to sucker and the quality of bush produced when budded with 5 varieties.

8318. Ticknor, R. L., and Smith, R. L.
Producing more No. 1 roses per acre. *Amer. Nurserym.*, 1965, **121**(8): 14.

Following soil analyses plots of Peace and Condesa de Sastago roses received 7 different fertilizer treatments in their first year. These comprised (per acre): 100 lb. P_2O_5 with and without 1 lb. B, 100 lb. KO_2 as either KCl or K_2SO_4, 100 lb. K_2O+100 lb. P_2O_5, 1 lb. B alone, and no fertilizer. In the second year all plots received 100 lb. N per acre as urea or ammonium sulphate. Neither variety responded to P_2O_5 alone, whereas growth was improved with $K_2O+P_2O_5$. Otherwise the varieties responded differently to the other treatments; none had any effect on Condesa de Sastago, whereas all treatments except P_2O_5 and P_2O_5+B resulted in improved growth of Peace compared with unmanured plants. There was no difference in the responses of either variety to 2 forms of N applied in the second year. —N. Willamette Exp. Stat. Aurora, Ore.

8319. Hager, K. J., and Seeley, J. G.
Foliar applications of iron solutions for control of iron chlorosis of roses. *Pa Flower Grs' Bull.*, 1965, No. 173, pp. 3, 6-7, bibl. 15, illus.

Eleven Fe salts were applied at 3 rates (equivalent to 0·5, 1 and 2% ferrous sulphate solutions), with or without distilled water or a wetting agent (Triton B 1956), to chlorotic leaves of Better Times rose. Where the wetter was omitted the leaves were not dipped into the solutions but immersed for some time. No treatment completely restored green colour to the foliage; solutions equivalent to a 0·5% solution of ferrous sulphate had no effect, and the higher rates produced irregular green speckling. The response of the leaves differed considerably for different treatments. All treatments were phytotoxic to some extent. (This research was conducted [in 1950-51] before chelated iron was available. It is published so that the information on various sources of iron will be available to growers and researchers.—Note by editor of bulletin.)

8320. Stryckers, J.
Herbiciden vanaf het zaaibed tot bij de oogst! **(Herbicides from seed-bed to harvest.)** *Meded. BedrVoorlicht. Oost-Vlaanderen* **31**, 1965, pp. 3, bibl. 3.

Advice for rose growers.

8321. Procenko, E.
Powdery mildew on roses. [Russian.] *Zašč. Rast. Vred. Bolez.*, 1965, **10**(4): 42-3.

Sprays listed for the control of *Sphaerotheca pannosa* var. *rosae* include various sulphur compounds, TMTD and zineb. The preparation is described of the most frequently used material, a copper-soap emulsion, which can be safely applied even during flowering. Excessive applications of N fertilizers should be avoided, as these encourage the growth of young leaves which are more susceptible to the disease.

8322. Sager, W., Schroeder, C., and Krone, P. R.
Proper use of "foam" materials extends flower life. *Mich. Flor.*, 1964, No. 405, pp. 21-2.

Comparisons were made between cut roses stood in water containing one of 8 different plastic foams, in water plus a preservative (Floralife) and in water alone. Flowers in water+preservative showed the greatest uptake of water and had the longest vase life. Some foams did not transfer water satisfactorily to the flower stems. [For earlier work see *H.A.*, 35: 3958.]—Mich. St. Univ., E. Lansing.

8323. Rutkowski, A., Batura, J., and Kopczynska, A.
L'huile d'églantier (*Rosa rugosa*). **(*Rosa rugosa* oil.)** [English and Spanish summaries 7 lines each.] *Oléagineux*, 1965, **20**: 383-5, bibl. 5, illus.

Seeds of *R. rugosa*, obtained as a by-product in the manufacture of vitamin C concentrate, were found to contain 14·3% oil and 14·9% protein (based on dry matter). The oil content of the kernels was about 40·7%. The free fatty acids included 44·5% linoleic acid, 32% linolenic acid, 17·6% palmitic acid and 5·2% oleic acid. The oil also contained 236 mg.% tocopherols and 74 mg.% carotene.—Olsztyn Coll. Agric., Poland.

8324. Stoïanova-Ivanova, B., Nikolova, D., and Tzvetkova, V.
Sur la composition des hydrocarbures non saturés dans la cire de l'essence concrète de fleurs de roses bulgares. **(The composition of the non-saturated hydrocarbons in the wax of the concrete of Bulgarian rose flowers.)**
Stoïanova-Ivanova, B., and Hadjieva, P.
Sur la composition des alcools dans la cire de l'essence concrète des fleurs de roses bulgares. **(The composition of alcohols in the wax of the concrete of Bulgarian rose flowers.)** *C.R. Acad. bulg. Sci.*, 1965, **18**: 141-4, bibl. 9; and 145-8, bibl. 6.

Other trees and shrubs.

(*See also* 8304.)

8325. Green, P. S.
The olive family in cultivation. *Arnoldia*, 1965, **25**: 13-27, illus.
Notes on genera of the Oleaceae that provide plants of ornamental value.

8326. Hilton, R. J., and others.
Rest period studies on seeds of *Amelanchier, Prunus*, and *Sorbus*. *Canad. J. Plant Sci.*, 1965, **45**: 79-85, bibl. 16.
Seed germinability based on chemical and embryo greening tests was used as a means for determining the duration and cause of the seed rest period in the species *Amelanchier*, *Prunus* and *Sorbus*. Both procedures provided reliable means for quick estimation of viability. After-ripening at 2° C. was found to be superior to 6° and 10° C. temperatures for breaking seed rest in all species, as was 120-day after-ripening when compared with 30-, 60- and 90-day periods. Scarification (a) by mechanical seed coat abrasion was harmful to germination; (b) with saturated NaOH solution for 20 minutes had no effect on germination; and (c) with concentrated H_2SO_4 for 10 to 20 minutes, depending on the species under test, was highly beneficial to germination. Chromatographic partition and bioassays of extracts from resting *Amelanchier* and *Sorbus* seeds revealed the presence of unidentified growth inhibitors, and these are presumed to be primary reasons for prolonged seed rest. [Authors' abstract.]—Ont. agric. Coll., Guelph.

8327. Fordham, A. J.
Germination of woody legume seeds with impermeable seed coats. *Arnoldia*, 1965, **25**: 1-8, illus.
Seeds of *Robinia pseudoacacia* showed 93% germination after treatment with hot water (190° F. and allowed to cool overnight), compared with between 14% and 33% after treatment with H_2SO_4 for ½ to 2 hours. Seeds of *Gleditschia triacanthos* and *Cytisus nigricans* germinated best after acid treatment. General advice is given on breaking seed dormancy by various methods. [See also *H.A.*, 34: 976.]

8328. Ailincăi, N., Grosu, A., and Cotea, V.
Stimularea înrădacinării butașilor lemnoși de la cîteva specii de arbuști decorativi. **(Stimulation of rooting in hardwood cuttings of some species of ornamental shrubs.)** [French and Russian summaries ½ p. each]. *Lucr. ști. Inst. agron. Iași*, 1964, pp. 283-90, bibl. 8.
Hardwood cuttings of *Forsythia, Philadelphus, Hibiscus, Fontanesia, Tamarix, Deutzia, Ligustrum* and *Spiraea* spp. differed greatly in their response to treatment with 0·005 and 0·01% IAA and 0·0003% 2,4-D. In some there was a definite increase in root formation and growth.

8329. Čaplygin, B. K., and Šahova, G. I.
The use of transparent films for the propagation of ornamental shrubs by green cuttings. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 55, pp. 56-63, bibl. 15, illus.
Cuttings taken in the summer from a large number of rose varieties gave a higher percentage of rooting in polythene-covered greenhouses or frames than in glass-covered frames. Cuttings of *Lonicera periclymenum* and *Viburnum opulus* var. *sterile* produced much larger root systems under polythene than under glass and the rooting of both species was about 30% higher under polythene. Light intensity in frames under whitewashed polythene was higher than under whitewashed glass, the humidity was lower and mean temperatures were higher and showed greater diurnal variations. The conflicting opinions about the rooting requirements of cuttings are discussed in the light of these results.

8330. Verzilov, V. F., and Runkova, L. V.
The use of preparation S-600 for the summer transplanting of trees and shrubs. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 54, pp. 85-9, bibl. 3.
Five-year-old cotoneasters were sprayed with the English product S-600 in a 1 : 9 concentration either immediately or 2 days before they were transplanted in July. 2-year-old maples were sprayed at 1 : 4 immediately before they were transplanted, and undisturbed roses and tradescantias were sprayed in the laboratory. The sprays reduced transpiration in the transplanted plants for only a few days following their application; nevertheless, subsequent growth was improved. In the undisturbed plants transpiration was inhibited for a longer period. Immediately after transplanting the respiration rate in sprayed maples was reduced by one-half and 48 hours after transplanting to one-tenth of that of the controls.

8331. Yelenosky, G.
Tolerance of trees to deficiencies of soil aeration. *Proc. int. Shade Tree Conf., 1964*, pp. 127-48.
Seedlings of 7 species of trees, including sugar maple and flowering dogwood, were subjected to soil aeration tests which included flooding, the exclusion of atmospheric air and saturation of the soil with various gases. Respiration was also studied in excised root tips growing in sand. American elm seedlings proved the most tolerant and tulip tree seedlings the least tolerant to poor soil aeration. Little-leaf linden, Moraine honey locust, white oak, sugar maple and flowering dogwood were intermediate in their reaction. [See also *H.A.*, 34: 7188.]

8332. McKee, H. C.
Air pollution and its effects on trees. *Proc. int. Shade Tree Conf., 1964*, pp. 149-63, bibl. 7, illus.
Symptoms are described for damage caused by SO_2, fluorides and other industrial pollutants and by photochemical smog, which results from reactions in the presence of sunlight between NO_2 and organic compounds such as olefines. Twenty-one ornamental tree

species are listed according to their sensitivity to air pollution damage.—Southwest Res. Inst., Houston, Texas.

8333. Brzywcy-Kuninska, Z.
Preliminary investigations on the influence of sulphur dioxide on plants in a greenhouse. [Polish.] *Zesz. nauk. Inst. Gospodarki Komunalnej, Warszawa*, 1964, No. 8, pp. 5-49, from abstr. in *Informationsdienst, Weihenstephan*, 1965, No. 5, p. 74.

Three years' investigations on the sensitivity of numerous trees and shrubs.

8334. Brown, G. N.
Temperature controlled growth rates and ribonucleic acid characteristics in mimosa epicotyl tissue. *Plant Physiol.*, 1965, **40**: 557-61, bibl. 20.

A fuller account of work on *Albizzia julibrissin* abstracted in *H.A.*, 35: 3968.

8335. Kausch, W., and Haas, W.
Chemische Unterschiede zwischen Sonnen- und Schattenblättern der Blutbuche (*Fagus sylvatica* cv. *atropunicea*). **(Chemical differences between sun and shade leaves of copper beech.)** *Naturwissenschaften*, 1965, **52**: 214-15, bibl. 3.

Compared with indirectly lighted shade leaves growing on the north side of the tree or inside the crown, sun leaves growing in full sunlight on the south side of the tree had higher dry-matter contents of crude lipids, cutin, starch and ash but a lower content of holocellulose.—Inst. landw. Bot., Univ. Bonn.

8336. Rusanov, N. F.
Intergeneric hybrids between catalpa and *Chilopsis*. [Russian.] *Bjull. glav. bot. Sada*, 1964, No. 55, pp. 44-7, illus.

Including a promising new form *Catalpa* sp. × *Chilopsis linearis*.

8337. Griesel, W. O.
Initiation of floral primordia in *Cestrum diurnum* and *Cestrum nocturnum* in response to various photoperiodic patterns. *Plant Physiol.*, 1965, **40**: 268-73, bibl. 5.

C. nocturnum responded to long-short-day, short-long-day and long-day treatments. The critical day length in the long-short-day response was between 12 and 16 hours, whereas that in the short-long-day and long-day response was between 8 and 12 hours. The short-long-day response occurred at a younger age than the long-day response. *C. diurnum* plants with 3-month-old shoot systems responded to long-short-day treatment with a critical day length between 12 and 16 hours. Plants with 6-month-old shoot systems grown with constant light produced floral primordia when transferred to a 16- or 18-hour photoperiod. Plants maintained on an 8-hour photoperiod started to bloom in from 30 to 50 weeks and continued for the duration of the experiment. [From author's summary. For earlier work see *H.A.*, 35: 3974.]—Calif. St. Coll., Los Angeles.

8338. Davies, E. B.
Plant injury caused by coal ash being put on garden. *N.Z. J. Agric.*, 1965, **110**: 190, bibl. 1, illus.

When fresh carbonette ashes were spread on the soil round shrubs the plants developed symptoms of injury. The shrub most affected was *Clerodendron fargesii*, on which the leaves developed marginal leaf scorch and no berries were formed. Leaf analysis showed that the B content of the affected plant was 10 times as high as that of a normal plant. New Zealand coal has a very high content of B.—Ruakura agric. Res. Centre.

8339. Zeilinga, A. E.
Polyploidy in cotoneaster. Reprint from *Bot. Notiser*, 1964, **117**: 262-78, bibl. 13, illus., being *Meded. Inst. Vered. Tuinbouwgew. Wageningen* **226**.

Chromosome counts from root-tip material were made for 49 species, varieties and cultivars of *Cotoneaster*. The findings are listed, together with the chromosome numbers found by other workers. Species were shown to be either diploid or tetraploid; triploidy was found only in varieties and cultivars, and was associated with a reduction in fertility.

8340. Toole, E. R., and Filer, T. H., Jr.
***Colletotrichum gloeosporioides* on dogwood.** *Plant Dis. Reptr*, 1965, **49**: 351, illus.

Causing defoliation, stem die-back and cankers on *Cornus florida*.

8341. Schread, J. C.
Dogwood club gall. *Circ. Conn. agric. Exp. Stat.* **225**, 1964, pp. 6, illus.

Damage caused by *Mycodiplosis alternata* is described and results of spray treatments are discussed. Excellent control was obtained, particularly with Sevin, when more than 3 DDT or Sevin sprays were applied to the trees during May and June.

8342. Neely, D., and Himelick, E. B.
Effectiveness of Vapam in preventing root graft transmission of the Dutch elm disease fungus. *Plant Dis. Reptr*, 1965, **49**: 106-8, bibl. 5.

Infections of Dutch elm disease adjacent to previously diseased elms resulting from root graft transmission of *Ceratocystis ulmi* are often observed in municipalities controlling the disease with insect vector control procedures. Experimental data from parkway elms in two Illinois cities indicate that root graft transmission was reduced by two-thirds by applying the soil sterilant sodium *N*-methyldithiocarbamate (Vapam) between diseased and healthy elms. [Authors' abstract.]—Ill. nat. Hist. Surv., Urbana.

8343. Zimmer, K.
Untersuchungen über den Einfluss der Düngung, der Temperatur und der Tageslänge auf die Blütenbildung und die Blütenentwicklung von *Erica gracilis* Salisb. I. Untersuchungen über den Einfluss der Düngung. **(Investigations on the effects of fertilizers, temperature and day length on flower formation and flower development of *Erica gracilis*. I. Investigations on the effect of fertilizers.)** [English and French summaries ½ p. each.] *Gartenbauwiss.*, 1965, **30**: 115-43, bibl. 42, illus.

Ammonium nitrate was applied to 15-month-old pot plants growing in sand and peat, from May to October 1960 and 1961, in 10 or 16 doses supplying a total of 0 to 3,600 mg. N/plant. Fresh weight and shoot length increased with increasing N supply at the lower concentration ranges; with higher concentration rates they were reduced, the growth of terminal shoots was inhibited, much branching occurred and root growth was retarded. The proportion of vegetative shoots decreased with increasing N supply up to a certain limit, above which it increased. The average number of flowers per shoot steadily increased with increased N but flowering was delayed. Similar tendencies were observed when applications of N were staggered; flowering was most retarded if the main N application was in July. Late applications of N in Aug./Sept. promoted flowering and could counteract the retarding effect of an early supply in June/July. Applications of P and K had little effect on growth.—Tech. Hochsch. Hannover.

8344. Anon.
Temperaturens og daglængdens indflydelse på blomstringen hos erica. **(The effect of temperature and day length on the flowering of ericas.)** *Taspo*, 1964, No. 47, from abstr. in *Gartner Tidende*, 1965, **81**: 281.
Plants kept in short days of 8 to 10 hours and at a night temperature of 10° C. showed flower initials in 5–8 months. At a higher night temperature the tendency to produce flower initials was increased, and flower initiation took place most readily under conditions of long days and a high night temperature.

8345. van Dort, H. W.
Hoya, de wasbloem, een goede kamerplant. **(Hoya, the wax flower; a good house plant.)** *Vakbl. Bloemist.*, 1965, **20**: 625, illus.
Cultural advice on *Hoya carnosa* and *H. bella*, including propagation and control of pests.

8346. Ljubimova, M. N., and others.
The functional relationship between ATP and leaf movement in *Mimosa pudica*. [Russian.] *Doklady Akad. Nauk SSSR*, 1965, **161**: 964-7, bibl. 10, illus.
See *H.A.*, 35: 1514.

8347. Nicolini, G.
L'oleandro. **(Oleanders.)** *Ital. agric.*, 1965, **102**: 631-44, illus.
Biology, history of cultivation, poisonous and medicinal constituents, seasonal regulation of irrigation, trimming, soil mixtures for potting and growing in containers, and propagation by cuttings, seed and grafting.

8348. de Malahide, Lord T.
The genus *Olearia*. *J. roy. hort. Soc.*, 1965, **90**: 207-17, 245-50, bibl. 12, illus.
Numerous species and varieties of *Olearia* growing in a garden near Dublin described briefly with notes on their hardiness.

8349. Shanmugavelu, K. G.
Effect of gibberellic acid on endogenous auxins in plants. *Curr. Sci.*, 1965, **34**: 186-7, bibl. 11.
In seeds of *Peltophorum ferrugineum* and *Enterolobium saman*, soaked before germination in 100 p.p.m. GA for 48 hours, IAA-like endogenous auxins were present in the seedlings and increased until they were 6 days old and then declined. A similar auxin was found after spraying the seedlings with 25 p.p.m. GA. No IAA-like substance could be detected in the controls.—Annamalai Univ., Annamalainagar.

8350. Rao, D. S.
Chemical investigation of *Peltophorum inernis*. *Naturwissenschaften*, 1965, **52**: 262, bibl. 3.
The yellow flowers of *P. inerme* (= *P. ferrugineum*) contain a non-flavonoid pigment which has been named peltaphorin.—Univ. Kerala, Trivandrum, S. India.

8351. Sampson, D. R.
Breeding *Philadelphus* for double flower, purple center and low stature. *Euphytica*, 1965, **14**: 157-60, bibl. 2.
Results from 8 crosses involving 7 cultivars are recorded. Double flower is a recessive character with variable expression and irregular inheritance. Purple-centred corolla is a dominant character, also with variable expression. Two outstanding combinations for producing seedlings with low stature, small leaves and compact habit are Manteau d'Hermine × Dame Blanche and Frosty Morn × Erectus. [Author's abstract.]—Canada Dep. Agric., Ottawa, Ont.

8352. Wyman, D.
The mock-oranges. *Arnoldia*, 1965, **25**: 29-36, illus.
The origins of some modern *Philadelphus* cultivars are discussed, and a descriptive list is given of 29 species and cultivars considered to be of particular value as ornamentals.

8353. Brendel, G.
Untersuchungen über Hybriden der Gattung *Populus*, Sektion "Aigeiros" und ihren Einfluss auf die Biologie von *Dothichiza populea* Saccardo et Briard. **(Investigations on hybrids of the genus *Populus*, section Aigeiros, and their influence on the biology of *Dothichiza populea*.)** [English summary 1 p.] *Phytopath. Z.*, 1965, **53**: 1-34, bibl 51, illus.
Physiological and biochemical characteristics of different clones in relation to their susceptibility to *D. populea*.

8354. Kennedy, B. W.
Infection of *Potentilla* by *Xanthomonas fragariae*. *Plant Dis. Reptr*, 1965, **49**: 491-2, bibl. 5.
Twelve *Potentilla* spp. were inoculated with bacterial cultures from strawberry. *P. fruticosa* and *P. glandulosa* proved markedly susceptible and the symptoms resembled those on strawberries.—Univ. Minn., St. Paul.

8355. van Hoof, H. A., and Seinhorst, J. W.
Onderzoek naar grondvirussen in het boomteeltcentrum Boskoop. **(Investigation into soil-borne viruses in the tree-growing centre of Boskoop.)** [English summary ½ p.] *Meded. Dir. Tuinb.*, 1965, **28**: 256-7+summary, bibl. 1.
Xiphinema diversicaudatum was found in a few soil samples from one area and in one case was associated with arabis mosaic virus in *Ligustrum* species. Rattle virus occurred in 50% of the privet samples which contained *Trichodorus pachydermus*; *T. nanus*, which was also present, did not transmit the virus in tests.—Inst. PlZiekt. Onderz., Wageningen.

8356. Faegri, K.
Reflections on the development of pollination systems in African Proteaceae. *J. S. Afr. Bot.*, 1965, **31**: 133-6, bibl. 5.
In *Protea*, *Leucospermum* and other genera, with special reference to birds and beetles as pollinators.

8357. Krüssmann, G.
Zur Sichtung der japanischen Zierkirschen. (I und II.) **(Evaluation of the Japanese ornamental cherries. I and II.)** *Dtsche Baumsch.*, 1965, **17**: 130-7; 166-9, bibl. 4, illus.
The 49 varieties, species and hybrids described comprise 29 *serrulata* varieties, 7 *subhirtella* varieties and 13 other

species and hybrids. They are placed in 10 quality classes for the Dortmund area, with Kanzan, Shirotae and *sargentii* at the top.

8358. GORINI, F.
Stimolazione della fioritura nei *Prunus*. **(Flower forcing in *Prunus* species.)** *Riv. Ortoflorofruttic. ital.*, 1965, **49**: 197-201, bibl. 13, illus.

Potted plants of *Prunus sinensis* var. *alba* were induced to flower in time for the Christmas market by chilling at 5° C. throughout November and forcing at 22° C. in December. The flower and leaf buds opened in profusion within 16 days of forcing, whereas plants left in the open during the chilling time, with a total of 200 hours below 7° C., flowered about 8 days later and took longer to reach full bloom. Prolonging the chilling to 42 or 53 days did not reduce the forcing time below the 16–22 days needed after 30 days' chilling.—Staz. sper. Freddo, Milano.

8359. ZIMMERMANN, M. H., AND TOMLINSON, P. B.
Anatomy of the palm *Rhapis excelsa*. 1. Mature vegetative axis. *J. Arnold Arbor.*, 1965, **46**: 160-78, bibl. 26, illus.

The structure of the vascular tissue and a cinematographic method used in determining it are described in detail.

8360. LIPSCOMB, H. A., AND WITCHER, W.
Canker of tulip poplar caused by *Fusarium solani*. *Plant Dis. Reptr*, 1965, **49**: 507-8, bibl. 1, illus.

The symptoms on *Liriodendron tulipifera* described.

TOBACCO.

General.

8361. WILLEMS, G. K.
La culture du tabac dans le nord du Limbourg. **(Tobacco growing in North Limbourg.)** *Rev. Agric., Brux.*, 1965, **18**: 173-9.

Varietal, fertilizer and spacing trials begun in 1958 at several localities are still in progress and other trials have been laid down. Varieties now being tested include V.E.106, Ergo and Semois 8. Brief cultural notes cover soils, rotation, soil preparation, fertilization, spacing, cultivation and topping. Harvesting and curing are also discussed.

8362. SERVICIO NACIONAL DEL CULTIVO Y FERMENTACIÓN DEL TABACO, MADRID.
Estudios agroedafológicos de las regiones tabaqueras españolas. I. Extremadura. **(Crop and soil studies on the tobacco-growing regions of Spain. I. Extremadura.)** [English summary $\frac{2}{3}$ p.] [*Publ.*] *Inst. nac. Invest. agron., Madrid*, 1964, pp. 98, bibl. 21, illus.

Since 1933 the Spanish tobacco variety Valencia has been largely replaced in Extremadura by White Burley No. 5. Details are given of the composition of soils, irrigation water and tobacco leaves in the 4 main zones of the region, together with information on varieties, buildings for drying, climate and manuring.

8363. NORTH CAROLINA AGRICULTURAL EXTENSION SERVICE.
A costs and returns guide for selected field crops in North Carolina. *Circ. N.C. agric. Ext. Serv.* **462**, 1965, pp. 36.

Including flue-cured and burley tobacco.

Breeding, varieties and types.

8364. DULIEU, H.
Détection des plantes haploïdes parmi la descendance du croisement entre *Nicotiana tabacum* L et *N. sanderae* Hort, après irradiation du pollen. **(Detection of haploid plants among the progeny of *N. tabacum* × *N. sanderae* after pollen irradiation.)** *C.R. Acad. Sci., Paris*, 1964, **239**: 4126-9, from *CORESTA Inf. Bull.*, 1965, No. 1, Abstr. 1283.

Pollinating White Burley tobacco plants with X-irradiated pollen from *N. sanderae* resulted in the fertilization of approx. 1% of the ovules. Of the seeds produced only 0·5% gave rise to viable seedlings. At the time of flowering 6 haploid plants were isolated; these showed a quantitative variability with respect to plant height and flower size which does not appear in normal diploid populations.

8365. TRAMVALIDIS, C., AND DEVREUX, M.
Fertilité pollinique de *N. tabacum* après irradiation gamma aux stades gamètes, zygote et proembryon. **(Pollen fertility in tobacco after gamma-irradiation of the gamete, zygote and pro-embryo.)** *Caryologia*, 1964, **17**: 453, from *CORESTA Inf. Bull.*, 1965, No. 1, Abstr. 1275.

Pollen fertility diminished as the dose increased from 1,000 to 4,000 r. Susceptibility was greatest at the gamete stage, less after fertilization.

8366. SOLOV'EVA, V. M.
Studies on some methods of obtaining hybrids with the characteristics of two male parent forms in tobacco and mahorka. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 200-5.

By using two sources of pollen. [See also *H.A.*, 33: 5591.]

8367. BURCEV, JU. A., AND BURCEVA, G. JU.
The production of non-suckering forms of mahorka. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 284-6, illus.

A non-suckering type is described, which occurred in the second seedling generation derived from seeds of the variety Jubilejnaja which had received X-ray treatment at 30,000 r.

8368. BAWOLSKA, M.
Studies on the susceptibility to blue mould of some wild species of the genus *Nicotiana* and of cultivars of *N. tabacum* and *N. rustica*. [Polish.] *Post. Nauk roln.*, 1963, **10**(3): 51-63, from *CORESTA Inf. Bull.*, 1965, No. 1, Abstr. 1346.

The results are presented of inoculation experiments on 31 wild species, 63 cigarette tobaccos, 40 heavy tobaccos and 69 cultivars of *N. rustica*. *N. debneyi* and *N. exigua* remained uninfected; *N. paniculata* and *N. plumbagini-*

folia showed only slight symptoms. Resistant Hicks and Hicks Fixed A_2 were field resistant; the oriental tobaccos Nova Crnja, Prilep and Samsun H also showed good resistance. Among the broadleaf tobaccos, Dragon Vert, Greenwood, H-27-5, Havana IIc and Havana III/3 were those least infected. All varieties of *N. rustica* were attacked, Kapa, Komarno VII and Brasile Selvaggio being somewhat less susceptible than the others. [See also *H.A.*, 34: 5327.]

8369. Izard, C., and Schiltz, P.
Recherche de variétés résistantes à *Peronospora tabacina*, à partir de l'amphidiploïde *N. suaveolens* × *N. tabacum* var. *chinensis*. **(Studies on varieties resistant to *P. tabacina*, based on the amphidiploid *N. suaveolens* × *N. tabacum* var. *chinensis*.** *Ann. Dir. Ét. Équip. S.E.I.T.A., Sect. 2*,* 1964, **1**: 105-13, bibl. 3, illus.

Details of promising breeding lines.

8370. Mounat, A., Bown, G., and Hitier, H.
Observations sur des cultures d'hybrides de première génération résistants au mildiou. **(Observations on first generation hybrids resistant to blue mould.)** [English and German summaries ½ p. each.] *Ann. Dir. Ét. Équip. S.E.I.T.A., Sect. 2*,* 1964, **1**: 237-48.

Studies were made on 4 hybrids derived from Hicks Resistant and 4 from Bel 61-10. The hybrid Paraguay P 48 × Hicks F_1 was taken as the standard of comparison among hybrids; they were also compared with Hicks, Bel 61-10 and P 48. The morphological characters of the hybrids were strongly influenced by the resistant parent. Bel 61-10 hybrids were consistently late in maturing. During 1962 and 1963 the main crops were free from blue mould; in attacks on the second growth Bel 61-10 and its hybrids achieved a better resistance level than Hicks and its homologous hybrids. The weight yields of hybrids were slightly more than those of their respective resistant parents but increases were not significant compared with P 48. During and after curing and fermentation the behaviour and properties of Hicks hybrids were superior to those of Bel 61-10. None of the hybrids was appreciably superior to P 48 × Hicks F_1.

8371. Fantechi, F., and Lorito, N.
Osservazioni sulla resistenza alla *P. tabacina* di alcuni ibridi resistenti e cultivars italiane. **(Studies on the resistance to blue mould of some resistant hybrids and Italian cultivars.)** [English summary ½ p.] *Tabacco*, 1964, **68**: 241-85, bibl. 10.

Seed-bed and field trials, experiments under controlled environmental conditions and the use of the cotyledon test [see *H.A.*, 34: 1258] confirmed the extreme susceptibility of Burley G.R. and Burley Ky 16 to *P. tabacina*. The cultivar C.101 showed very little resistance, but A_2-2-27-2 was highly resistant.

8372. Josifović, M., Perišić, M., and Stojanović, D.
Ispitivanje otpornosti duvana prema *Peronospora tabacina* Adam. **(Investigations on the resistance of tobacco to *Peronospora tabacina*.)** [English summary ¾ p.] *Zašt. Bilja*, 1964, **15**: 565-8.

Of 100 F_1 hybrids tested 31 were resistant to blue mould and are listed. All the 13 Yugoslav varieties on trial were susceptible. Of 15 American and Australian selections 9 were resistant, and in the others infection ranged from 18 to 100%. Out of 14 *Nicotiana* spp. only *N. debneyi* and *N. knightiana* proved immune.

8373. Endemann, W., and Egerer, A.
Selection of F_1 tobacco hybrids for blue mould resistance. *Proc. 3rd World Tob. Sci. Congr., Salisbury*, 1963, pp. 307-10, from *Tob. Abstr.*, 1965, **9**, Abstr. 524.

Blue mould resistance in certain Australian varieties and breeding lines was inherited by the progeny in crosses with susceptible varieties. Resistant types gave low yields and were susceptible to brown vein disease. Some of the F_1 hybrids showed marked heterosis in addition to resistance. The breeding line S390/1 proved the most promising parent in breeding for both resistance and hybrid vigour. [See also *H.A.*, 34: 3320.]

8374. Reisch, W.
Über Krankheitsresistenz, Ertrag und Qualität von blauschimmelresistenten Neuzüchtungen **(The disease resistance, yield and quality of new blue mould-resistant selections.)** *Dtsch Tabakbau*, 1965, **45**: 119-23, bibl. 8, illus.

An evaluation of recently issued burley, cigar and Virginia selections.

8375. Lea, H. W., and Willetts, H. J.
Development of nematode resistant tobacco variety for Australian conditions. I. An evaluation of the T.I. 706 source of root-knot resistance in New South Wales. *Proc. 3rd World Tob. Sci. Congr., Salisbury*, 1963, pp. 293-5, from *Tob. Abstr.*, 1965 **9**, Abstr. 539.

Hybrids derived from the tobacco line T.I. 706 were resistant to *Meloidogyne incognita* in the U.S.A., but were ineffective against *M. javanica* in N.S. Wales, as in America.

8376. Haslam, R. J.
Burley tobacco variety Harwin. *Canad. J. Plant Sci.*, 1965, **45**: 109-10, bibl. 2, illus.

Details are given of origin and agronomic characteristics; Harwin shows tolerance of etch virus and good resistance to black and brown root rots.

8377. LaPrade, J. L., Crews, J.W., and Rogers, M. J.
VA. 115, a new flue-cured variety with black shank resistance. *Res. Rep. Va agric. Exp. Stat., Blacksburg*, **96**, 1965, pp. 4, illus.

This variety originated from a Hicks × Coker 139 cross; its black-shank resistance is high, and yield and quality are good. It resembles Hicks but the leaves are less smooth and more closely spaced.

8378. Rao, P. S.
The bidi. *Tobacco, N.Y.*, 1965, **160**(26): 30-2, 49, illus.

Characteristics, culture and processing of bidi tobacco.

8379. Institut de Recherches Agronomiques Tropicales et des Cultures Vivrières.
Qu'est-ce que le tabac? Définition des types industriels et leur utilisation. **(What is tobacco? A definition of industrial types and their uses.)** *Cah. Agric. prat. Pays chauds*, 1965, No. 1, pp. 33-40, bibl. 7, illus.

Notes on the botanical, chemical and commercial classifications of tobacco types and on methods of curing.

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* Formerly *Ann. Inst. exp. Tabac Bergerac*.

Seeds, planting and environment.

(*See also* 8158.)

8380. Čirkovskij, V. I.
The extension of seed viability during storage. [Russian.] *Agrobiologija*, 1965, No. 2, pp. 286-9, illus.

Experiments are described in which tobacco seeds, which were stored in a dry atmosphere (10% R.H.) for periods of 20 or 27 years, germinated as well as seeds stored under normal conditions for only 2 or 3 years. Seeds which had been stored at 60% R.H. for 3 years germinated in the laboratory (33%), but the seedlings did not emerge from the soil in field trials. However, seeds stored for 1 or 2 years under these conditions behaved normally.

8381. Staikov, G.
Seed vernalization in relation to dormancy period and degree of maturity. [Bulgarian, with English and Russian summaries ½ p. each.] *Rasten. Nauki*, 1965, **2**: 11-21, bibl. 18.

In tobacco and castor the dormancy period is an important obstacle to the completion of the vernalization stage which follows. Vernalized physiologically ripe seeds complete their stages of development more rapidly than those which are physiologically unripe. Seed vernalization has a positive effect on growth, development and yield and provides an opportunity for obtaining 2 crops in the same year.

8382. Kuznecov, G. Ja.
Using new techniques in the mechanization of tobacco growing. [Russian.] *Tabak*, 1965, **26**(2): 32.

Horticultural machinery suitable for use in tobacco growing includes implements for planting, irrigation and seed-bed soil disinfection.

8383. Pevzner, L. M.
Spacing trials in tobacco culture in Moldavia. [Russian.] *Tabak*, 1965, **26**(2): 35-6.

In 3 years' trials of 6 spacings from 60 × 20 to 70 × 30 cm. the highest average yields were obtained with 60 × 20 cm. However, 70 × 30 cm. was more economical and produced tobacco with the best flavour.

8384. Bartolucci, A.
Closer spaced transplanting, very high topping and nocturnal harvesting: productivity and quality improvement factors in oriental tobacco of the Xanthi-Yaka types. [English and French.] *CORESTA Inf. Bull.*, 1965, No. 1, pp. 21-4.

In 3 years' experiments at 5 places in southern Italy close spacing encouraged the firm rooting of transplants. Dawn harvesting had little effect when practised alone, but when combined with very high topping and close spacing quality was improved by 32%, weight by 23% and market value by 49%. In 1958 waste was reduced by 33% with dawn harvesting, by 34% with very high topping and by 24% with close spacing. The 3 practices used together reduced waste by 60%. It is recommended that 300,000 plants per ha. be planted to realize 200,000 productive plants. Plants should be topped when the first 3 pods are present and all leaves should be picked before sunrise.

8385. White, F. H.
Differences in response of two varieties of cigar tobacco to variations in plant population and nitrogen fertilization. *Canad. J. Plant Sci.*, 1965, **45**: 264-9, bibl. 9.

At each of two N fertilizer levels the variety Pennsylvania Broadleaf, irrespective of plant spacing, produced higher yields and returns per acre, more leaves per plant and weight per leaf, but a higher percentage o midrib and yellow trash leaf than the variety Resistant Havana 211. Although the differences between the varieties at each N level were relatively unaffected by plant spacing, the 20-in. spacing caused a reduction in yield, crop returns and percentage of yellow leaf, and an increase in weight per leaf and percentage of filler leaf compared with those obtained with the 16-in. spacing. An increase in N fertilizer from 24 to 60 lb. per acre had little effect on Resistant Havana 211 other than to increase the weight per leaf. With Pennsylvania Broadleaf, however, the yield, crop returns, weight per leaf and percentage of filler leaf were increased. Different rates of N fertilizer had little effect on the grade index, number of leaves per plant and percentages of nicotine, nornicotine and total alkaloids in both varieties. The combination of 16-in. spacing with 60 lb. of N was superior to other combinations of 16- or 20-in spacing with 24 or 60 lb. of N per acre for the production of cigar filler leaf in each of the varieties. [From author's abstract.]—Canada Dep. Agric., Delhi, Ont.

8386. Solov'ev, A. P., Ivanova, I. D., and Micenko, I. A.
Raising tobacco seedlings in soilless culture. [Russian.] *Tabak*, 1965, **26**(2): 32-5, illus.

Trials are reported in which seedlings of 2 varieties were raised in a soil mixture and on substrates of pebbles, keramzite [a porous clay filler], sand and vermiculite plus keramzite. The best seedling growth was obtained on the vermiculite plus keramzite medium followed by keramzite alone and pebbles.

8387. Cremaschi, D.
Prova di coltivazione di tabacco sub-tropicale da fascia in capanna di polietilene di colore biancolatte. **(Trial on the growing of sub-tropical cigar wrapper tobacco in houses covered with milk-white polythene.)** [English summary ½ p.] *Tabacco*, 1964, **68**: 259-72, bibl. 11, illus.

Scafati 7 tobacco was grown in a shed having a roof of cheese cloth and the walls of milk-white plastic, and in a similar shed entirely covered with plastic. No significant differences were noticed in plant height but the leaf surface area was greater in those plants grown under cheese cloth. The plastic covering provided favourable conditions for the development of fungus and virus diseases, especially TMV.

Moisture relations and sucker control.

8388. Patel, G. C.
Root distribution and moisture extraction pattern of flue-cured tobacco under dry conditions. *Indian Tobacco*, 1964, **14**: 187-97, bibl. 3.

Detailed moisture extraction data are tabulated. An average of 5·3 in. of water was used by the crop between transplanting and the fourth priming stage (about 105 days). Of this, 45%, 31% and 24% were contributed by the first, second and third one-foot layers of soil, respectively. The peak period of moisture use was 50–60 days after planting, preceding the peak growth period by 10–20 days. The relationship between moisture use and time after transplanting is expressed as a quadratic regression function. Root distribution, as judged by dry root weight, was concentrated in the top foot of soil (92%) and laterally in a 5-in. radius around the plant. A positive correlation existed between the moisture used and the root weights obtained from the first and second 3-in. depths of soil.—Tob. Res. Inst., Rajahmundry.

8389. PATEL, G. C.
Extraction of soil moisture by flue-cured tobacco under irrigated and dry conditions. *Indian Tobacco*, 1964, **14**: 179-85, bibl. 6.

Plants were given 3 irrigation treatments (one irrigation at 40, 50 or 60 days after planting) and no irrigation (control) in an experiment with flue-cured tobacco conducted for 3 seasons. The resulting crop yield and moisture extraction pattern suggest that a zone of 2–2½-ft. depth of soil is crucial for root activities and moisture supply. The water needs of the crop increase after about a month and one supplemental irrigation of 1–1½ in. about 40 days after planting produced the best results. The efficiency of water use was highest when irrigation was given at this time and declined when irrigation was later. Efficiency also tended to decline when irrigation was given after the commencement of cracking in clay soils. [From author's summary.]—Tob. Res. Inst., Rajahmundry.

8390. CHOUTEAU, J., AND OTHERS.
Incidence de l'arrosage des cultures de tabac en été sec. (The effects of watering tobacco in a dry summer.) [English and German summaries ⅓ p. each.] *Ann. Dir. Ét. Équip. S.E.I.T.A., Sect. 2*,* 1964, 1: 35-47, bibl. 2.

In trials carried out in the dry summer of 1962 the increase in mean yields due to irrigation was in the range 30–39%: this was more marked in the upper than the lower leaves. For a given irrigation pattern supplementary N at 120 kg./ha. increased yields over those obtained with 60 kg./ha., but the differences were not significant. Leaves from the irrigated crop were larger, thinner, more mature and of better colour than those from the unirrigated crop. These improvements were not fully shown in the lower leaves unless the N fertilization had been adequate. The nicotine and N contents of irrigated tobacco were slightly lower than those of unirrigated tobacco. The effects of irrigation on the acid-base equilibrium were not clear but the upper leaves were richer in combined organic acids. The plants used were hybrid F_1 Hicks R × P. 48.

8391. DE BAETS, A.
Invloed van anti-scheutoliën op de kwaliteit van tabak. (The effect of sucker-inhibiting oil on tobacco quality.) [French, English and German summaries ⅓ p. each.] *Meded. LandbHogesch. Gent*, 1964, **29**: 1167-80.

The total yield and leaf combustibility were greater for tobacco treated with vegetable (colza) oil than for untreated crops, but in general the differences in quality were very small.

Nutrition.

8392. HRISTOZOV, D.
The effect of foliar nutrition on the yield and quality of tobacco. [Bulgarian, with English and Russian summaries ⅓ p. each.] *Rasten. Nauki*, 1965, **2**(2): 39-48, bibl. 17.

In the fertilizer experiment described half the NPK was applied to the soil and the other half given in foliar sprays as single, double or treble applications. Yields were highest with 2 and 3 foliar sprays, the increase over the controls being inversely related t rainfall, reaching 14–18% when this was very low. Quality was not reduced by foliar applications.

8393. SUKUMARAN, K. M., AND NAIR, C. K. N.
Investigations on the effect of foliar application of nitrogenous fertilizers on growth and yield of chewing tobacco (*Nicotiana tabacum* Linn.). *Agric. Res. J. Kerala*, 1965, **3**: 58-68, bibl. 5, illus

Urea, ammonium sulphate and ammonium nitrate were applied either as foliar sprays or to the soil at rates o 1, 2, 3 or 4 g. per plant. The results of growth an yield studies are presented in tabular form. Urea was the most effective spray. All foliar applications increased the growth and yield considerably (mean cured leaf yield = 123% of the control), but soil applications were even more effective (mean cured leaf yield = 162 of the control), except for plant height and number of leaves.—Agric. Coll. Res. Inst., Vellayani.

8394. DIMITROV, C.
Rates of mineral nitrogen application in fertilizin tobacco as affected by soil texture. [Bulgarian *Bălg. Tjutjun*, 1964, No. 3, pp. 36-42, from *CORESTA Inf. Bull.*, 1965, No. 1, Abstr. 1310.

A relationship was shown to exist between the effect of N fertilizers and soil texture: higher rates of N lowered tobacco quality because of the reduced absorption capacity of the light soils on which oriental tobaccos ar usually grown. The best results were obtained b applying 25 kg./ha. N to soils with up to 10% of so particles under 0·01 mm. in diameter, 30 kg./ha to soils with up to 20% of particles under this size and 40 kg. to soils with 20–25% of such particles. Nitrogen and P should be combined in a ratio of N : P_2O_5 = 1 : 2–3.

8395. PETROV, T.
Agricultural and economic effects of fertilizing tobacco plants with ammonia water. [Serbo-Croatian.] *3rd internat. Tob. Symp., Skopje, 1964*, from *CORESTA Inf. Bull.*, 1965, No. 1, Abstr. 1315.

The following N fertilizers were applied to soil which had previously been treated with 250 kg./ha. superphosphate: ammonia water, one half applied before transplanting and the remainder after the second weeding; ammonia water applied all at once before transplanting; ammonium chloride; and ammonium sulphate. On non-irrigated fields the ammonia water treatments gave the best results.

8396. PATEL, G. C.
Potash and phosphate manuring of flue-cured tobacco grown in black cotton soils of Andhra Pradesh—problems and progress—a review. Part I. Soil and climate. Part II. Nutrient uptake and chemical composition of flue-cured tobacco. *Indian Tobacco*, 1964, **14**: 199-208, bibl. 6; 209-12, bibl. 5.

The morphological, physical and chemical characteristics of the black cotton soils are described in detail. Soil and climate are compared with those considered ideal for the crop. Comparative figures are presented of the results of chemical analyses of U.S. and Indian tobaccos and of the removal of plant nutrients by these rops. The contributions of K and P to tobacco lant growth are reviewed.—Cent. Tob. Res. Inst., Rajahmundry.

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* Formerly *Ann. Inst. exp. Tabac Bergerac.*

397. Kakie, T.
Studies on phosphorus metabolism in the tobacco plant. Part 2. Incorporation of radioactive phosphorus into phosphorus compounds during the ripening stage of tobacco leaves. *J. Sci. Soil Manure*, 1964, **35**: 269-72, from abstr. in *Soil Sci. Plant Nutrit.*, 1965, **11**(1): 43.

Most of the radioactive P was incorporated into P ompounds soluble in cold 10% trichloroacetic acid. As ime progressed there was a steady decrease in the P ompounds soluble in TCA and an increase in those Insoluble in TCA. Phosphorus compounds in the aminae of the plants supplied with radioactive P in the arly stage of ripening were labelled rapidly. Radioctive P was also incorporated to a significant extent in lants supplied at a late stage of ripening. [For part see *H.A.*, 33: 7733.]—Okayama Tob. Exp. Stat.

398. Chouteau, J.
Études sur la fertilisation potassique du tabac: comparaison du bicarbonate de potasse et du sulfate de potasse en présence de doses variables d'azote. (**Studies on the potassium fertilization of tobacco: comparison of potassium bicarbonate and potassium sulphate in the presence of varying amounts of nitrogen.**) [English and German summaries ½ p. each.] *Ann. Dir. Ét. Équip. S.E.I.T.A., Sect. 2*,* 1964, **1**: 49-63.

n pot trials carried out with hybrid F_1 Hicks × Paraguay he K salts were supplied at 1, 3 and 6 g. K_2O per plant nd N at 2·5 and 5 g. per plant. The general effect of K, rom either source, was to improve the physical properties and combustibility after air-curing. It accumuated preferentially in the central leaf rib and this was ccompanied by reductions in the sum of cations and the lkalinity of the ash. It did not much affect the yields. ompared with sulphate, the bicarbonate delayed the nset of growth, produced lower leaves of less weight nd median leaves of similar green weight but greater ater content. The dry leaves were paler, finer, more niform and slightly more combustible. The results f foliar diagnosis indicated that sulphate was better bsorbed at the start, but towards harvest greater uantities of K were accumulated by bicarbonatereated tobacco. The cation sum and ash alkalinity ere slightly greater in bicarbonate-treated tobacco. s was the N content. [For related work see *H.A.*, 34: 259.]

399. Chouteau, J.
Étude, en vases de végétation, de la fumure potassique du tabac dans des sols de richesse variable en K échangeable. (**Pot culture studies on the potassium fertilization of tobacco in soils of variable exchangeable K content.**) [English and German summaries ⅔ p. each.] *Ann. Dir. Ét. Équip. S.E.I.T.A., Sect. 2*,* 1964, **1**: 215-35, bibl. 2, illus.

en light soils of different exchangeable K content were sed and the plants were each supplied with 5 g. N, ·8 g. P_2O_5 and 0, 3 or 6 g. K_2O. The added K caused small increase in leaf length on the poorest soils, and creased the leaf moisture content. The effect on dry weight was only positive on the poorest soils. The cured leaf quality was improved in all cases. Combustibility diminished rapidly from lower to upper leaves; without additional K the tobaccos were barely combustible but a positive correlation existed between the exchangeable K of the soil and the combustibility of lower and middle leaves for the K_0 and K_1 treatments. The results of foliar diagnosis and chemical analysis indicated that when K nutrition was insufficient the K passed preferentially to the upper leaves; the content was greater in the lower leaves when nutrition was adequate. The effect of the treatments on the foliar parenchyma was an inverse function of the initial exchangeable K content of the soil. Increasing supplies of K led to a decrease in the Ca, Mg and N contents, and the sum $K+Mg+Ca$ also tended to decrease with increasing K.

8400. Hill, J.
Environmental induction of heritable changes in *Nicotiana rustica*. *Nature*, 1965, **207**: 732-4, bibl. 9.

Changes produced in an inbred variety of *N. rustica* by N, P and K applied alone and in various combinations have been transmitted through two generations without any further treatments being applied and are therefore considered to be heritable.—Univ. Birmingham.

Physiology, composition and leaf weight.

(*See also* 6877, 6904, 6935, 7017, 8463.)

8401. Linsmaier, E. M., and Skoog, F.
Organic growth factor requirements of tobacco tissue cultures. *Physiol Plant.*, 1965, **18**: 100-27, bibl. 30, illus.

An auxin (IAA), a kinin (kinetin) and thiamine were essential for *in vitro* growth of tobacco variety Wisconsin No. 38 in a new medium of which the composition is given. *myo*-Inositol was required for rapid growth and high yields. With appropriate levels of these 4 growth factors fresh weight yields of about 22 g. 50 ml. medium of loose parenchyma or lower yields of more compact tissue of excellent quality and viability were obtained. For longevity, thiamine was especially important. Folic acid or *p*-aminobenzoic acid significantly improved the total yield. Ascorbic acid and L-glutamic acid increased the yields only in combinations with suboptimal levels of thiamine. Biotin and calcium pantothenate were without effect. Riboflavin was inhibitory. Vigorous development of chemically induced shoots and roots was obtained. Evidence is also presented for satisfactory growth of excised pith tissue and callus cultures of 4 other varieties on this medium. [From authors' summary.]—Univ. Wis., Madison.

8402. Izard, C.
Réactions des plantules excisées de l'hybride tumoral *N. glauca* × *N. langsdorfii* et du mutant non tumoral 345, à l'application de divers métabolites dont un hydrocarbure cancérigène. (**Reactions of excised seedlings of the tumorous hybrid *N. glauca* × *N. langsdorfii* and of the non-tumorous mutant 345 to the application of various metabolites including a carcinogenic hydrocarbon.**) *C.R. Acad. Sci., Paris*, 1965, **260**: 2061-3, from *CORESTA Inf. Bull.*, 1965, No. 1, Abstr. 1264.

The roots of 5-day-old seedlings were removed above the root hair region; after a few days the hypocotyl lengthened (*a*) and the tumorous hybrid formed a tumour (*b*) whereas the mutant 345 formed a scar callus (*c*). IAA added to the culture medium at concentrations of 100–4,000 g./l. slightly increased *a*, *b* and *c*; kinetin and 6-benzylaminopurine added in the same concentrations strongly inhibited *b* and slightly stimulated *c*. IAA was found to be antagonistic to the 2 kinins as regards their action on *b*, but reinforced their stimulating action on *c* without causing tumorous growths in the mutant 345. Gibberellic acid strongly stimulated *a*. The carcinogen 3,4-benzopyrene strongly inhibited *a* and *b*, whereas 1,2-benzopyrene, which is not a carcinogen, had practically no effect. [See also *H.A.*, 35: 2468.]

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* Formerly *Ann. Inst. exp. Tabac Bergerac.*

8403. SIROIS, J. C., AND PARUPS, E. V.
Studies on the effect of gibberellic acid on some endogenous growth regulators of tobacco. *Physiol. Plant.*, 1965, **18**: 70-8, bibl. 22.

The effects of GA treatment on the ethanol-extractable growth regulators of Resistant Havana 211 tobacco plants were studied. Growth activity was measured by the *Avena* coleoptile elongation test on portions of chromatograms of tissue extracts. At least part of the increase in growth-promoting activity obtained from GA-treated plants was caused by residual GA in the tissues. The GA treatment also caused the disappearance of an endogenous acidic inhibitor of IAA activity. The effect of GA on growth processes is discussed in the light of its effect on this inhibitor. [Authors' summary.]—Canada Dep. Agric., Ottawa.

8404. POPOV, K., JORDANOV, I., AND UŠEVA, N.
Experiments on the chemical stimulation of photosynthesis in tobacco leaves. [Russian.] *C.R. Acad. bulg. Sci.*, 1965, **18**: 75-8, bibl. 14.

The rate of photosynthesis was determined by measuring the $C^{14}O_2$ uptake in tobacco and mahorka leaves treated with KNO_3 and NH_4NO_3 at 3 concentrations. The treatments increased photosynthetic activity by an average of 20–40% compared with the controls. NH_4NO_3 was more effective and its action did not depend on the concentration of the solution. KNO_3 at 0·1% depressed, but at 0·25 and 0·5% stimulated, photosynthesis. In further experiments KBr, hydroquinone and penicillin were also found to stimulate photosynthesis.

8405. FOX, J. E., CHEN, C.-M., AND GILLAM, I.
Glucose catabolism in normal and autonomous tobacco tissue cultures. *Plant Physiol.*, 1965, **40**: 529-34, bibl. 14.

A pronounced difference in O_2 consumption and glucose catabolism existed between an auxin-kinin dependant tobacco tissue and a derived strain autonomous for these growth regulators. On a dry weight basis the latter took up O_2 at a rate roughly half again as fast as the former, although the rate of glucose uptake was about the same in the 2 strains. Data from respiration studies suggest that the greater growth rate and increased O_2 consumption in the autonomous tissue are associated with an enhanced decarboxylation of pyruvate derived from glucose. [From authors' summary. For earlier work see *H.A.*, 34: 5297.]—Univ. Kans., Lawrence.

8406. MOURAD, E. B.
Evidence for cytoplasmic DNA in root cells of *Nicotiana*. *J. Cell Biol.*, 1965, **24**: 267-76, illus., from *Tob. Abstr.*, 1965, **9**, Abstr. 941.

See also *H.A.*, 35: 4055.

8407. BRAD, N. A.
Some aspects of ribonucleic acids, chlorophyll, an protein in detached plant leaves. *Diss. Abstr* 1964, **25**: 3238, being *Order No.* 64-12,209 163 pp.

The effects were investigated of leaf detachment, ro excision and root redevelopment on the RNA, protein chlorophyll, area and weight of tobacco leaves. Lea detachment and root excision promoted the senescenc of mature leaves and stopped the development of youn ones. Chlorophyll, RNA and protein levels dropped i young detached leaves even though the cut ends wer immersed in a balanced inorganic nutrient solution an the leaf blades were exposed to light. The RNA lev of young leaves also declined in plants with the roo system removed and the cut end immersed in a nutrien solution. However, upon the redevelopment of adver titious roots the RNA level increased and was accom panied by increases in chlorophyll and protein levels a well as leaf weight and area. Three different metho for the estimation of RNA in tobacco leaves wer evaluated.—Univ. Calif., Los Angeles.

8408. COÏC, Y., TENDILLE, C., AND GERVAIS, C.
Variation des quinones chloroplastiques c feuilles de tabac par rapport aux chlorophyl sous l'influence de l'âge et de la nutrition azote **(Variation of chloroplast quinones of tobacco leav relative to chlorophyll according to age and nit gen nutrition.)** [English summary ⅓ p.] *An Physiol. vég.*, 1965, 7: 57-70, bibl. 13, illus.

Young tobacco plants cultured on vermiculite we deprived of N for 18 days, after which balanced nutr tion was restored. The results of analyses of young an old leaves indicated that when chlorophyll synthesis c degradation occurred the plastoquinone A conte varied inversely with the chloroplast pigment conte between the limits 1 : 9 and 1 : 2. It was mo abundant in old than in young leaves, and in N-deficie leaves than in normal leaves. The vitamin K content was about 1% of chlorophyll; it became les with decreasing N in young leaves and recovered i original level when normal nutrition was restore Significant quantities of vitamin E (1·2–3·2 mg./100 fresh matter) were found only in leaves from plan which lacked N. Improvements in analytical techniqu are suggested.—Cent. nat. Rech. agron., Versailles.

8409. JYUNG, W. H., WITTWER, S. H., AND BUKOVA M. J.
Ion uptake by cells enzymically isolated from gree tobacco leaves. *Plant Physiol.*, 1965, **40**: 410-14 bibl. 23.

An improved method for the enzymic separation of cel from green tobacco leaves is described. The isolate cells, appropriately suspended and incubated in aqueou solution, were utilized for studies of Rb and phosphat uptake. Cells from leaves, stems and roots of bea seedlings were also isolated, and relative rates of R uptake were estimated. [From authors' summar For earlier work see *H.A.*, 35: 3268.]—Mich. St. Univ E. Lansing.

8410. KISBAN, C., AND OTHERS.
Role of the root system in the regulation of enzym levels in leaf tissues. *Acta bot. hung.*, 1964, 1 274, from *CORESTA Inf. Bull.*, 1965, No. Abstr. 1265.

Discs punched from leaves of 2–4-month-old *Nicotiana glutinosa* × *N. tabacum* var. *Xanthi Nc* hybrids were floated on tap water. Compared with tissues of leaves remaining on the plant the detached tissues showed increased dehydrogenase (G-6P, 6P-G and malic), diaphorase (NADPH, NADH), oxidase (NADH, polyphenol), ribonuclease, alkaline pyrophosphatase, dehydroascorbic acid reductase, fructose 1,6 diphosphatase and glutamic acid decarboxylase activities.

8411. Parthier, B.
Verlust der Hemmstoffwirkung von Chloramphenicol in Tabakblättern. **(Loss of growth-inhibiting effect of chloramphenicol in tobacco leaves.)** *Naturwissenschaften*, 1965, **52**: 214, bibl. 9, illus.

Chloramphenicol supplied to excised fully-grown *Nicotiana rustica* leaves rapidly lost its growth-inhibiting capacity. Kinetin sprayed on the leaves after the chloramphenicol treatment later increased the protein-synthesizing capacity. [For earlier work see *H.A.*, 34: 7277.]—Bot. Inst., Halle.

8412. Stocks, D. L.
A study of the biochemistry of riboflavin in higher plants as influenced by iron. *Diss. Abstr.*, 1964, **25**: 3253-4, being *Order No.* 64-13,749 of 99 pp.

The effect was studied of mineral nutrition, species and ageing on the excretion of riboflavin into nutrient solutions. Deficiencies of major elements did not significantly affect the excretion of riboflavin but deficiences of Mo, Zn and Mn resulted in 3- to 4-fold increases over that of the controls. Only Fe deficiency caused major increases in excretion, being in some cases as much as 1,000 times that of the controls. Three species, including tobacco var. Havana 38, were found to be very sensitive to Fe deficiency in this respect, whereas another 8 species, including *Phaseolus vulgaris* var. Wade, tomato, radish and turnip, were quite insensitive. The excretion of riboflavin by tobacco plants was not affected by ageing. Riboflavin was absorbed and translocated by tobacco roots, the amount absorbed being proportional to the concentration of riboflavin in the nutrient solution. The photo-degradation products of riboflavin were studied; 4 were tentatively identified and 4 others with low Rf values were isolated but not identified. Illuminated healthy and chlorotic excised tobacco leaves grown in Hoagland's solution containing 25 μg./ml. riboflavin were ground and analysed for riboflavin and its degradation products. One unidentified yellow fluorescing compound was consistently present in the leaf extracts that was completely absent from the standard. Riboflavin in concentrations of 25 μg./ml. was not toxic to healthy leaves but was toxic to chlorotic leaves exposed to light.—Utah St. Univ.

8413. Raney, F., and Vaadia, Y.
Movement and distributions of THO in tissue water and vapor transpired by shoots of *Helianthus* and *Nicotiana*. *Plant Physiol.*, 1965, **40**: 383-8, bibl. 9.

In *N. rustica* plants grown in a tritiated nutrient solution.

8414. Schuster, G.
The effects of virus infection and the duration of light and darkness on the levels of the citric acid cycle acids in the leaves of various solanaceous plants under different photoperiods. [German.] *Flora*, 1964, **153**: 490-5, from *CORESTA Inf. Bull.*, 1965, No. 1, Abstr. 1409.

Short-day plants (*Nicotiana tabacum* var. Mammoth), day-neutral plants (*N. tabacum* var. Virginia Gold) and long-day plants (*N. sylvestris*) were compared under long and short days. After some of them had been inoculated with PVX and TMV their citric and total organic acid levels were determined each week. There appeared to be no interaction between photoperiodism and virus inoculation.

8415. Eskarous, J. K., and Naguib, M. I.
Carbohydrate and nitrogen content of a virus-diseased tobacco plant. *Experientia*, 1964, **20**: 618-19, from *Tob. Abstr.*, 1965, **9**, Abstr. 555.

Virus infection [unspecified] seemed to have no significant effect on the different soluble carbohydrate fractions of tobacco leaves. Furthermore, in spite of the fact that the total polysaccharide content was more or less similar in both diseased and healthy leaves, the glucosan content was higher and the galactosan content lower in the former than in the latter. The only effect of the virus on the carbohydrate metabolism seemed to be the activation of starch phosphorylase accompanied by retardation of hexose isomerase.

8416. Płatek, J.
Studies of domestic tobacco. III. The main alkaloids and their occurrence in some commercial varieties. [Polish.] *Chemia analit.*, 1964, **9**: 107-13, from *Analyt. Abstr.*, 1965, **12**, Abstr. 2447.

Nicotine and nornicotine, with small amounts of anabasine, in Polish-grown tobaccos. The chromatographic method of analysis is described. [For part II see *H.A.*, 33: 5630.]

8417. Patče, L., Stojkovska, A., and Uzunovski, M.
Nicotine content of Macedonian tobaccos in relation to the growing region, leaf position and degree of maturity. [Serbo-Croatian.] *3rd internat. Tob. Symp., Skopje, 1964*, from *CORESTA Inf. Bull.*, 1965, No. 1, Abstr. 1271.

The varieties Jaka, Prilep, Otlja, Blatec and Mulaip were sampled and analysed. The nicotine content varied from 1·65 to 1·94%, Jaka containing the least and Blatec and Mulaip the most. The highest quality tobaccos contained 1·5–1·6%. In any given variety the nicotine content varied with the production area. The nicotine content also varied with leaf position, being greater in leaves at the top of the plant; it also increased with leaf ripeness. Bassara-damaged tobacco contained less nicotine and more starch after curing, and was of inferior quality.

8418. Bajlov, D., and Sečenska, M.
Changes in the contents of green and yellow pigments in tobacco leaves during ripening. [Bulgarian, with German and Russian summaries 1 p. each.] *Rasten. Nauki*, 1965, **2**(3): 15-23, bibl. 8.

Determinations of the contents of chlorophylls a and b, carotene and xanthophyll were made on 3 grades of leaves of 4 small-leaved oriental tobacco varieties. The pigment content proved to be a reliable guide to the degree of leaf ripeness, since it rose until technical maturity was reached and thereafter declined. The maximum concentration of pigment attained varied according to variety, this variation being greater in the lower leaves than in middle and upper leaves. During the vegetative phase the accumulation of chlorophylls a and b was greatest in the variety Stanimaka Pembe 536 and least in Rila 9, the latter showing the highest carotene and xanthophyll contents.—Inst. Plant Product. and Inst. Plant Physiol., Sofia.

8419. Ramakrishnayya, B. V., and Murty, G. S.
Chlorine content of the tobacco leaf in relation to its position on stalk. *Indian J. Plant Physiol.*, 1964, **7**: 30-4, bibl. 16.

Leaf samples were taken at 15-day intervals from plots of the variety Harrison Special which had been treated with 0 or 150 lb. Cl/acre in the form of NaCl. Samples from the chloride-treated plots always contained more Cl than the controls. Irrigation increased the Cl content of the leaf. The Cl content was most marked in the first 8 leaves taken from the base of the plants, basal leaves having the highest Cl content and the top leaves the lowest. Leaf samples of the second priming were the most suitable for these tests.—Cent. Tob. Res. Inst., Rajahmundry.

8420. Patče, L., and Stojkovska, A.
A contribution to the study of the leaf weight per unit area in Macedonian tobaccos. [Macedonian, with French summary 1 p.] *Annu. Fac. Agric. Sylvic. Skopje, Agric., 1961-62*, 1962, **15**: 161-75, bibl. 11, illus.

The weight per unit area of tobacco leaves varied with variety and position on the stem, and was affected by environment. In leaves of similar maturity and stem position the lowest values were shown by the variety Jaka; 8% higher values were shown by Otlja, Blatec and Mulaip, and 13·6% higher by Prilep. Weight per unit area increased with ascending leaf position and with advancing maturity. Over-ripe leaves showed lower values. The weight per unit area of leaves affected by bassara was 20·5% higher than that of healthy leaves. [See also *H.A.*, 33: 5608.]

Ozone damage and diseases.

(*See also* 7807, 8368-8374, 8376, 8377, 8414, 8415, 8449.)

8421. Macdowall, F. D. H.
Predisposition of tobacco to ozone damage. *Canad. J. Plant Sci.*, 1965, **45**: 1-12, bibl. 26, illus.

Studies on the effects of ontogeny, genome, N and water supplies and ozone itself in predisposing tobacco plants to ozone damage (including weather fleck) were made in the field and greenhouse. The fully expanded leaf became susceptible to low doses of ozone when its protein content started to fall. Topping slowed the development of susceptibility of leaves. The effects of genome were at least partly of an ontogenetic nature. Susceptibility was enhanced by both deficiency and excess of N. Moisture prior to fumigation increased susceptibility. Long term effects of moisture supply were akin to its influence on drought hardiness. Susceptibility was increased by shortened photoperiod, low day temperature and high night temperature, indicating a protective influence of photosynthate. A large or a small dose of ozone appeared to predispose against or toward, respectively, susceptibility to the next dose. Wherever tested, stomatal opening was positively associated with damage. [From author's abstract. See also *H.A.*, 34: 5316 and 35: 1545.]—Canada Dep. Agric., Ottawa.

8422. Lee, T. T.
Sugar content and stomatal width as related to ozone injury in tobacco leaves. *Canad. J. Bot.*, 1965, **43**: 677-85, bibl. 16, illus.

Tobacco leaves containing 5–14 mg. sucrose per g. dry weight were more susceptible to ozone injury than those of higher sucrose content. Leaves with 5–35 mg reducing sugars per g. dry weight were also more sensitive to ozone than those with lower reducing sugar content. Introducing soluble sugars into the leaf varied its sensitivity to ozone depending on the concentration of the sugars, the duration of sugar treatment and conditions of the leaf itself. Ozone damage was positively correlated with the width of stomatal opening but under certain conditions stomatal closure did not prevent leaf injury. High levels of sucrose and reducing sugars were associated with closure of stomata. Independently of the osmotic effect on stomatal movement increasing the sucrose content beyond the optimum for high sensitivity prevented damage from ozone. [From author's abstract.]—Canada Dep. Agric., Delhi, Ont

8423. Macdowall, F. D. H.
Stages of ozone damage to respiration of tobacco leaves. *Canad. J. Bot.*, 1965, **43**: 419-72, bibl. 23

A damaging dose of ozone initially inhibited the respiration of fumigated leaves and of mitochondria removed from them. Stimulation of leaf respiration occurred later, together with visible signs of damage and inhibition of photosynthesis. Mitochondria prepared from such visibly damaged tissue also showed stimulated activity. However, their cytochrome oxidase activity was inhibited and their oxidative phosphorylation was suppressed, thus resembling known effects of cyanide and carbon monoxide. [From author's abstract.]—Canada Dep. Agric., Ottawa.

8424. North Queensland Tobacco Growers' Co-operative Association.
Control of some diseases and insects in seed beds *Aust. Tobacco J.*, 1965, **6**(April): 17-18.

Recommendations for the control of blue mould damping-off, mosaic and leaf miners.

8425. Munshi, Z., and Choudhry, A. H.
Some correlation studies between temperature and "leaf curl" incidence in cigarette tobacco. *Pakist. J. Sci.*, 1964, **16**: 48-52, bibl. 3.

Harrison Special tobacco plants were transplanted on 5 dates, viz. 15 and 30 August, 15 and 30 October and 15 November, and evaluated for leaf curl infection. Infection was reduced with later planting dates. An examination of weekly mean temperatures and leaf curl infection established positive and significant correlations between infection and temperature. The least infection was observed in November-transplanted tobacco.—Agric. Res. Inst., Tandojam.

8426. Murakishi, H. H.
Cell-associated virus infectivity of tissue cultures derived from susceptible and resistant sources. Abstr. in *Phytopathology*, 1964, **54**: 902.

Callus tissue cultures were obtained from healthy, TMV-resistant and susceptible tobacco and tomato by growing stem segments on White's agar medium plus coconut milk, 2,4-D and NAA. Inoculation was accomplished by mechanically shaking the tissue cultures in White's liquid medium in the presence of TMV. At various intervals cell samples were removed, washed in sucrose-phosphate buffer and assayed on Pinto bean leaves. The peak of cell-associated infectivity was reached at 96 hours, followed by a sharp decline at 144 hours for susceptible Turkish and Samsun tobacco and for Bonny Best tomato. With a resistant

acco and a resistant tomato peak infectivity was
ched at 144 hours and tended to remain high for
0 hours.—Mich. St. Univ., E. Lansing.

27. Parish, C. L., and Zaitlin, M.
Necrotic local lesion formation by tobacco mosaic **virus.** Abstr. in *Phytopathology*, 1965, **55**: 502.

studies with *Nicotiana sylvestris* and 2 strains of
acco mosaic virus, U1 and U2, it was concluded
t the increased O_2 consumption accompanying local
on formation results from the necrosis and not from
s multiplication *per se*. Both strains infected
sylvestris, but only strain U2 incited local lesions.
ly U2-infected tissue had an enhanced respiration
e. The lesions and surrounding areas appeared to
rich in polyphenol oxidase. Lesions treated with 10
23 polyphenols darkened markedly. In addition,
echol accelerated the appearance of necrotic lesions
about 12 hours. Diethyldithiocarbamate and
orbic acid reduced lesion numbers. Lesions which
med after infiltrating leaves with ascorbic acid,
wever, were larger than those in the controls. The
ults support and extend the indications that the
nomenon of necrotic lesion formation involves
phenols and polyphenol oxidase. It is not known
rus multiplication incites the polyphenol oxidase
tem directly or if the polyphenol oxidase system is
mulated as a secondary response to cell injury result-
g from virus multiplication.—Univ. Ariz., Tucson.

28. Thrower, L. B.
A radioautographic study of the formation of local lesions by tobacco mosaic virus. *Phytopathology*, 1965, **55**: 558-62, bibl. 15, illus.

e accumulation of C^{14}-labelled metabolites around the
eloping local lesions of TMV on *Nicotiana glutinosa*
d *Datura stramonium* was followed by means of
dio-autography. Leaves were supplied with $C^{14}O_2$
intervals after they had been inoculated and a further
hours elapsed before drying. The 2 hosts showed
same general behaviour with some differences in the
mporal sequence. For 60–80 hours the radioactive
ons increased in radius. Inactive regions appeared
the centres of the spots and these enlarged until the
tire lesions became inactive. Reassimilation of
pired CO_2 was not responsible for the formation of
ive spots; this was due to movement within the leaf
sue. Accumulation is considered to be due to
hanced synthetic processes at the infection centre
nsequent upon the production of virus. [From
thor's abstract.]—Univ. Melbourne, Victoria.

29. Kubo, S., and others.
Chromatography of tobacco mosaic virus, its constituents, and nucleic acids extracted from infected tobacco leaf tissues. *Virology*, 1965, **26**: 406-12, bibl. 19.

ethods for the extraction and separation of viral RNA
n infected tobacco leaves are described.

30. Takahashi, T., and Hirai, T.
Oxidative and phosphorylative activities of mitochondria from tobacco leaf epidermis infected with tobacco mosaic virus. *Physiol. Plant.*, 1965, **18**: 219-28, bibl. 17.

tochondria obtained from tobacco leaf epidermis
ected with TMV for 20 hours oxidized succinate,
te, α-ketoglutarate, malate and pyruvate more
idly than did those from uninfected leaf epidermis.
ed activities of NADH-cytochrome *c* reductase, succinate-cytochrome *c* reductase, NADH-diaphorase and cytochrome *c* oxidase were also found in infected epidermal mitochondria. No difference was observed between the phosphorylating efficiency of mitochondria from infected and uninfected epidermis. Both kinds of mitochondria responded similarly to various inhibitors. From these results it is suggested that mitochondria from infected and uninfected leaf epidermis differed only quantitatively, but not qualitatively, in their oxidative and phosphorylative activities. [Authors' summary. See also *H.A.*, 35: 1593.]—Nagoya Univ., Anjo, Japan.

8431. Francki, R. I. B.
Multiplication of tobacco mosaic virus in tobacco leaves treated with 6-methyl purine. *Phytopathology*, 1965, **55**: 533-5, bibl. 11.

Treatment of tobacco leaves with 6-methyl purine slightly inhibited the multiplication of TMV and injured the leaves. The range of analogue concentration over which virus synthesis was inhibited without serious damage to host tissue was very narrow. The analogue was not incorporated into TMV nucleic acid in detectable amounts and had no effect on the infectivity of the virus. [Author's abstract.]—Waite agric. Res. Inst., Univ. Adelaide, S. Australia.

8432. Izard, C.
Identification d'un nouveau virus provoquant la "nécrose des nervures" dans les plantations de tabac du Sud-Ouest de la France. (**Identification of a new virus causing rib necrosis in tobacco plantations in South West France.**) *Ann. Dir. Ét. Équip. S.E.I.T.A., Sect. 2,** 1964, **1**: 16-25, bibl. 12, illus.

Studies suggest that the virus is a Y complex with a necrotic component.

8433. Sequeira, L.
Origin of indoleacetic acid in tobacco plants infected by *Pseudomonas solanacearum*. Abstr. in *Phytopathology*, 1964, **54**: 907.

Pathogenic strains of *P. solanacearum* synthesize IAA via pathways other than tryptophan decarboxylation and deamination, whereas tobacco (var. Bottom Special) converts both tryptophan and tryptamine into IAA. This difference in pathways enabled an estimation to be made of the relative contribution of either host or parasite to the IAA pool. IAA was extracted from healthy and diseased tobacco plants after they were allowed to take up 12·5 mg. tryptamine-HCl and 0·5 μc. tryptamine-2-C^{14}-HCl plant. Within 48 hours after inoculation the amount and labelling of IAA were similar in healthy and diseased plants. However, as symptoms appeared 4–6 days after inoculation parallel increases in IAA and its specific activity occurred in diseased tissues. As pathogenesis progressed IAA continued to increase, but its specific activity gradually declined. It is concluded that, during the initial critical interaction between host and parasite, the host contributed most of the IAA. Synthesis by the pathogen appears of importance only at advanced stages of pathogenesis. [See also *H.A.*, 33: 1394 and 35: 4080.] —Univ. Wis., Madison.

8434. Farkas, G. L., and Lovrekovich, L.
Enzyme levels in tobacco leaf tissues affected by the wildfire toxin. *Phytopathology*, 1965, **55**: 519-24, bibl. 49.

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* Formerly *Ann. Inst. exp. Tabac Bergerac*.

Tobacco half-leaves were injected with toxin-containing culture filtrates of *Pseudomonas tabaci* and the other halves of the same leaves with nutrient medium (control). Toxin treatment induced typical chlorotic symptoms, a marked breakdown of proteins and, simultaneously, a change in the activities of a number of enzymes. As measured in tissue extracts, 14 of 25 enzymes tested have shown a marked increase in activity upon treatment of tissues with the wildfire toxin. The activity of 4 enzymes was reduced in the toxin-treated half-leaves. The activity of the other 7 enzymes tested remained more or less unchanged in spite of the toxin-induced protein breakdown. There was a striking similarity between the enzymatic and other metabolic characteristics of tobacco tissues affected by the wildfire toxin and those observed in detached yellowing leaves. At least part of the characteristic enzyme activations in diseased tissues was due to protein breakdown which appeared to liberate enzymes from inactive forms. [Authors' abstract. See also *H.A.*, 33: 5691.]—Inst. Plant Physiol., Eötvös Univ., and Res. Inst. Plant Prot., Budapest, Hungary.

8435. Hartill, W. F. T.
M-45 gives better control of anthracnose. *Tob. Forum*, 1965, No. 14, pp. 2-4, from *Trop. Abstr.*, 1965, **20**, Abstr. n1409.

Trials by the Tobacco Research Board in Rhodesia show that M-45, a zinc-activated maneb formulation, is slightly superior to thiram or zineb for the control of anthracnose in tobacco seedlings. A concentration of 100–150 g. of 80% w.p. per 100 l. is recommended. Spraying should start 2–3 weeks after germination and thereafter be repeated twice weekly.

8436. Rossouw, D. J.
Control of tobacco powdery mildew. [Afrikaans summary 13 lines.] *Tech. Commun. Dep. agric. tech. Serv., S. Afr.*, **28**, 1964, pp. 5, bibl. 6.

In the 4 experiments described karathane, either as a 2% dust or as a spray (1 lb. per 100 gal.), effectively controlled *Erysiphe cichoracearum.* Frequent weekly applications were the most satisfactory, but 2 only with a week's interval also gave excellent control.

8437. Populer, C.
Le comportement des épidémies de mildiou du tabac, *Peronospora tabacina* Adam. II. Étude comparée des épidémies de mildiou dans le monde. **(The behaviour of epidemics of tobacco blue mould. II. Comparative study of blue mould epidemics throughout the world.)** [English summary $1\frac{1}{2}$ pp.] *Bull. Inst. agron. Gembloux*, 1964, **32**: 435-508, bibl. 179, maps.

The appearance of initial foci of infection, the spread of the disease and the ensuing damage are compared in Europe and N. America with some references to Australia. Current hypotheses on the annual recurrence of the disease are discussed. A map is presented of the probable course of future European epidemics, based on 1961-3 isochronal data. It is deduced from a study of the relationships between epidemic chronology and ecological factors that blue mould can overwinter almost anywhere, that long-distance airborne contamination is only a supplementary source of infection and that the theory that gradual spring warming of the land mass accounts for the staggering of primary infection foci is not valid for Europe, with the exception of the Mediterranean basin. The supposed inhibitory effect of high summer temperatures is questioned in t light of Australian evidence. Proposed empirical a warning systems are discussed. [For part I see *H.* 35: 6288.]

8438. Populer, C.
Le mildiou du tabac, *Peronospora tabacina* Ada Chronologie de l'apparition annuelle des foye en Europe. **(Chronology of the annual appearan of tobacco blue mould foci in Europe.)** *Parasitic* 1965, **21**: 37-9, bibl. 1, map.

Tobacco blue mould was introduced into north-weste Europe in 1959 and had invaded all the tobacco areas Europe and the Mediterranean region within 4 year As shown on a map the first outbreaks in 1964 followe a chronological distribution in good agreement with t average pattern of the 3 previous years. In 1964 t first foci appeared a little later than usual, in Marc April in the region south of the Mediterranean, up the end of June in Turkey and the Balkans and not un June in the east of Poland.—Stat. Phytopath. Éta Gembloux.

8439. Zachos, D. G.
Le mildiou du tabac en Grèce. Épidémiolog et moyens de lutte. **(Blue mould of tobacco Greece. Epidemiology and control methods** *Ann. Inst. phytopath. Benaki*, 1964, **6**: 44-6 bibl. 2, illus.

Over-wintering tobacco plants are thought to be th main source of primary infection of early sowings in t south of Greece. The intensity of the epidemic eac year is related to the temperature and rainfall durin April-June; if the number of days of rain is low. t severity and spread of infection are limited. Whe strict control measures are taken with early sowings, t later epidemic is mild even if meteorological conditio favour it. Control measures, which are compulsor include the destruction of over-wintering tobacco an *N. glauca*, the use of zineb sprays on seedlings an maneb sprays every 5 days or less after transplanting and the destruction of infected plants. In 1963, whe weather conditions favoured the disease, damage wa limited to 2·5%. [See also *H.A.*, 34: 5329.]

8440. Hindi, E., Dishon, I., and Nevo, D.
Observations on tobacco blue mold in Israe *Plant Dis. Reptr*, 1965, **49**: 154-6, bibl. 3.

The standard treatment for control of *Peronospor tabacina* in seed-beds is thrice-weekly application o 6·5% zineb dust at 400–600 g./100 sq. m., beginning soon after germination and continuing throughout th nursery period (30–40 applications). Treatment in th field consists of up to 8 weekly applications at 30 kg./ha. beginning soon after transplanting and continuing unti the end of the rains in late May. In irrigated field weekly treatment should continue throughout th season with additional applications immediately befor and after irrigation. In a seed-bed trial with 8 fungi cides applied twice weekly from 4–5 weeks afte germination maneb gave even better results than zineb providing complete control in one case compared with total destruction in the control beds. Zineb, Antroco (metabolite of zineb) and Polyram Combi (zinc activated polyethylene-thiuram disulphide) each gave about 90% control.—Minist. Agric., Jaffa.

8441. Wark, D. C., and Mandryk, M.
Resistance of tobacco to stem infection by *Peronospora tabacina* Adam. *Nature*, 1965, **207** 214-15, bibl. 2.

lants of 14 breeding lines, the cultivar Virginia Gold nd *Nicotiana debneyi* were inoculated at the base of e stem with a suspension of conidiophores of *P. bacina* 8 weeks after sowing. Except in *N. debneyi* nd the line *CA* 229, all lines showed some stem fection 3 weeks later. This was comparable with the fects of infection in the field. The results suggest that em inoculation could be used as an indication of the sceptibility of breeding lines. [See also *H.A.*, 33: 704 and 34: 1250.]—C.S.I.R.O., Canberra.

442. Hitier, H., and others.
Traitements fongicides contre le mildiou du tabac (essais 1963). **(Fungicidal treatments against blue mould of tobacco: 1963 trials.)** [English and German summaries ⅔ p. each.] *Ann. Dir. Ét. Équip. S.E.I.T.A., Sect. 2,** 1964, **1**: 115-34, illus.

s treatments for seedlings and in the field maneb 6% nd B. 5078 (propylene bis-dithiocarbamate of Zn) 10% usts were equally efficient and persistent. Dusting was ore effective than spraying. On seedlings maneb 4%, neb 7%, mancozeb (Dithane M-45) 4–6% and Zn etiram 4% dusts were also efficient, but less ersistent. Difolatan (a similar product to captan), ramycetin and Diram (dimethyl dithiocarbamate of a) sprays were not effective; tannin and zineb sprays nly slightly so. The fungicides which had been found seful on seedlings were also effective in the field during short attack of blue mould late in the season. After e principal harvest treatment was continued on the econd growth during a prolonged period of rain. In ese conditions the fungicides appreciably reduced the amage but could not be relied upon to save the crop. pplications should be made according to the weather, nd not to a prearranged schedule.

443. Reich, R., and Neubert, P.
Rückstände einiger Fungizide auf Tabak nach Behandlung gegen *Peronospora tabacina* (Adam). **(Residues of some fungicides on tobacco after treatments for the control of *Peronospora tabacina*.)** *NachrBl. dtsch. PflSchDienst, Berlin,* 1965, **19**: 17-18, bibl. 10.

esidues from treatments with zineb dust and with ifferent concentrations of maneb, ferbam, zineb, onacol and a copper fungicide were determined for eshly harvested, air-dried, fermented and hand-rolled igar tobacco. The results are shown graphically. ineb dust left low, and the copper product very low, itial residues. Zineb and ferbam spray residues were onsiderable at first, but fermentation reduced them to ery low levels. Lonacol residues were intermediate nd their reduction during fermentation was less arked. Maneb left the highest initial and final esidues. Quality tests in 2 successive years on tobacco eceiving the customary 10 treatments showed no dverse effects of any of the above fungicides. [See lso *H.A.*, 33:. 5708.]

444. Dukes, P. D., and Apple, J. L.
Effect of oxygen and carbon dioxide tensions on growth and inoculum potential of *Phytophthora parasitica* var. *nicotianae*. *Phytopathology*, 1965, **55**: 666-9, bibl. 18.

vitro studies on the growth of *Phytophthora parasitica* ar. *nicotianae* at various O_2 and CO_2 levels are reported. igh CO_2 (15% or more) and low O_2 (5% or less) in the soil gaseous phase of 2 common tobacco soils in North Carolina for a period of 5 weeks did not alter significantly the inoculum potential of *P. parasitica* var. *nicotianae* as compared with that in soils with a normal gaseous phase. Apparently, this fungus would not be eliminated nor the inoculum potential greatly reduced in periodically flooded soils since the fungus can grow in as little as 6% O_2 and is tolerant to relatively high concentrations of CO_2. [From authors' abstract. See also *H.A.*, 34: 5336.]—Univ. N.C., Raleigh.

8445. Dukes, P. D., Jenkins, S. F., Jr., and Thompson, S. S.
Atypical symptoms of black shank on flue-cured tobacco. *Tobacco, N.Y.*, 1965, **160**(25): 26-8, bibl. 7, illus.

On young plants about 1 ft. tall a dark brown to black stem necrosis without root infection could not be visually distinguished from other stem rots. On mature plants the characteristic "disking" of the pith may not be present especially during periods of heavy rainfall, or owing to the presence of *Euxesta notata* larvae. Identification of the hyphae in the infected tissue may be necessary for correct diagnosis.

8446. Wills, W. H.
Effect of defoliation of tobacco on expression of resistance to *Phytophthora parasitica* var. *nicotianae*. Abstr. in *Phytopathology*, 1964, **54**: 912.

In greenhouse tests tobacco plants were grown in vermiculite immersed in nutrient solution. The defoliation of plants resistant to black shank resulted in disease losses much greater than in control plants. In 1 test 82% of defoliated NC95 (highly resistant) plants were killed compared with 20% of the controls, and 78% of the defoliated Vesta 5 (moderately resistant) plants were killed compared with 47% of the controls. The susceptible Virginia Gold population was 94% killed. When Vesta 5 plants were cut off 15–20 mm. above the crown, losses, as judged by necrosis of the remaining stem, were greater than when the plants were only defoliated. Losses were less among defoliated Vesta 5 plants grown in the same pan with normal NC95 plants than among those grown alone, but were greater when grown with susceptible Virginia Gold than when grown alone. A possible interpretation is that something inhibitory to the pathogen, produced in the leaves of resistant plants, was translocated down and released into the root medium, and defoliation prevented the operation of the mechanism.—Va polytech. Inst., Chatham.

Nematode and insect pests.

(*See also* 8375, 8424.)

8447. Graham, T. W.
Survival of *Meloidogyne javanica* on tobacco in South Carolina. Abstr. in *Phytopathology*, 1965, **55**: 498-9.

Greenhouse inoculum containing separate soil cultures of *Meloidogyne incognita acrita* and *M. javanica* were used to determine whether *M. javanica* (rarely found on tobacco in the Carolinas) would survive in the field. Plots to which *M. javanica* was added were also naturally infested with *M. incognita acrita*. The resulting mixture of species caused severe root galling on the susceptible tobacco variety Hicks in 1963, with approximately equal numbers of both species. Plantings were repeated in 1964 with Hicks in the same plot sites. Root galling was again severe; however, only *M.*

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* Formerly *Ann. Inst. exp. Tabac Bergerac.*

incognita acrita was found. *M. javanica* failed to survive during 1964 (following 1963 inoculation) on other varieties, including NC 95 which is resistant to *M. incognita acrita*, but susceptible to *M. javanica*.—U.S. Dep. Agric., Florence, S.C.

8448. Daulton, R. A. C.
Evaluation of chemicals for the control of the root-knot nematode, *Meloidogyne javanica*, in tobacco. *Rhod. J. agric. Res.*, 1965, **3**: 59-61, bibl. 1.

In a field comparison of 12 nematicides Zinophos at 4, 8 and 16 lb./acre caused outstanding reductions in infection accompanied by slight to moderate phytotoxic effects. Vorlex at 8·2 gal./acre was also very effective and not phytotoxic. TMCB at 1, 3 and 6 gal./acre killed most of the plants. Nellite, S.D. 7727, Tridipam and mercuric oxide in various doses were the least effective. Dorlone at 5 gal./acre compared favourably with the standard EDB at 5·5 gal./acre. Other compounds tested which gave intermediate results were U.C. 17956, DMNP, Trapex and 3,5-dimethyltetrahydro-1,3,5-2H-thiadiazine-2-thione. The last named gave good control of nematodes, weeds and grasses in seed-bed experiments when applied as 85% powder at 9–15 lb./100 sq. yd. Other chemicals evaluated in seed-beds were not so effective as methyl bromide. They included Vapam, N521, CBM, DBCP, V-C13 and N244.—Tab. Res. Bd Rhodesia, Salisbury.

8449. Legge, J. B. B.
The effects of foliar and soil applications of dimethoate and menazon on aphid infestation, virus infection and the yield and quality of tobacco. *Rhod. J. agric. Res.*, 1965, **3**: 23-32, bibl. 4.

Field tobacco plants were treated with dimethoate and menazon by spraying the foliage, by mixing the insecticides in the planting water, and by adding them in granular form to the fertilizer. Useful reductions in the amounts of rosette and bushy-top infection and increases in yield and quality were obtained following 3 weekly sprays with dimethoate at 6 oz. a.i. per acre or with menazon at 8 oz. Twice as much insecticide had to be used in soil application to achieve the same results. [Author's summary.]—Tob. Res. Bd S. Rhodesia, Salisbury.

8450. Graves, J. B., Bradley, J. R., and Bagent, J. L.
Laboratory evaluation of several organotin compounds against *Heliothis* spp. *J. econ. Ent.*, 1965, **58**: 583-4, bibl. 6.

Of several organotin materials tested against tobacco bollworm and budworm, trimethyltin acetate and trimethyltin hydroxide were the most toxic.

8451. Barlow, C. A.
Stimulation of oviposition in the seed-corn maggot fly, *Hylemya cilicrura* (Rond.) (Diptera : Anthomyiidae). [German summary ⅓ p.] *Ent. exp. appl.*, 1965, **8**: 83-95, bibl. 5, illus.

More eggs were laid in soil which contained pea seeds than in soil containing 3 other types of organic matter. Tobacco seedlings did not stimulate oviposition; the presence of large numbers of larvae in tobacco fields is apparently due to a combination of moist, disturbed soil and vegetable matter available at the time of oviposition.—Canada Dep. Agric., Chatham, Ont.

8452. Michel, E., and Chouteau, J.
Influence de la nutrition minérale du tabac su son parasite *Myzus persicae*: fécondité et taille des individus, formation des ailés. **(Effect of th mineral nutrition of tobacco on the parasite *Myzu persicae*: fecundity and size of individuals, forma tion of winged aphids.)** [English and Germa summaries ⅓ p. each.] *Ann. Dir. Ét. Équi S.E.I.T.A., Sect. 2,** 1964, **1**: 161-80, illus.

The fecundity of wingless aphids varied according to th composition of the plant. Whereas an increase in I content brought about a decrease in fecundity, a increase in K could improve it. [From author summary. See also *H.A.*, 34: 3413.]

8453. Michel, E.
Prolifération anormale du puceron *Myzu persicae* élevé sur tabacs traités a la phosdrin **(Abnormal multiplication of *M. persicae* reare on Phosdrin-treated tobaccos.)** [English an German summaries ½ p. each.] *Ann. Dir. É Équip. S.E.I.T.A., Sect. 2,** 1964, **1**: 183-96.

The aphids were raised on leaf discs under laborator conditions. The use of Phosdrin-treated leave resulted in improved daily fecundity, a lengthene reproduction period and increased life expectancy o young aphids.

8454. (Rao, R. S.).
Studies on the control of green peach aphids, *Myz persicae* Sulz, with systemic insecticides on flue-cured tobacco. *Indian Tobacco*, 1964, **14**: 214-15

During 1960-1963 diazinon 20% e.c. was compared wit dimethoate, thiometon, sulphoxide of demeton-methy and Phosdrin, and the contact insecticides, endrin malathion and Telodrin. The systemic insecticide were the more effective. Four applications per seaso of thiometon 25% e.c. were sufficient for effective contro compared with 6 applications of diazinon. The following were recommended: dimethoate 30% e.c. at 10 oz. sulphoxide of demeton-methyl 25% e.c. at 16 oz. thiometon 25% e.c. at 16 oz. and Phosdrin 20% e.c. at 20 oz., per 100 gal. water per acre.

8455. Michel, E.
Essai de deux produits aphicides endothérapiques: la vamidothion et l'azidithion contre les pucerons (*Myzus persicae*) s'attaquant au tabac. **(A trial of two endotherapeutic aphicides, vamidothion and azidithion, against *Myzus persicae* on tobacco.)** [English, and German summaries ½ p. each.] *Ann. Dir. Ét. Équip. S.E.I.T.A., Sect. 2,** 1964, **1**: 147-59.

Vamidothion liquid at 400 g. a.i./l. and azidithion (= menazon) as liquid, 70% w.p. and 5% granules were compared with demeton methyl. None had phytotoxic effects, and all caused complete destruction of aphid colonies. The addition of a wetting agent to azidithion liquid or powder retarded the aphicidal effect and reduced the persistence. During the first 24 hours the shock effect of the treatments was not superior to that of demeton methyl. The maximum effect of vamidothion appeared after 21 days; azidithion liquid took 8 days, w.p. 6 days, granules 13 days. Demeton methyl was entirely effective after 5 days. Azidithion had the longest lasting effect.

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* Formerly *Ann. Inst. exp. Tabac Bergerac.*

56. CHAMP, B. R., AND SHEPHERD, R. C. H.
Insecticide resistance in *Phthorimaea operculella* (Zell.) with particular reference to DDT. *Qd J. agric. Anim. Sci.*,* 1965, **22**: 69-81, bibl. 8.

rains of *P. operculella* [= *Gnorimoschema operculella*] om tobacco-growing areas of Queensland have been und resistant to DDT and endrin. No completely sceptible strains have been found in Queensland. e compound N,N-di-n-butyl-p-chlorobenzene sulonamide had no influence on DDT-resistant strains. emoval of insecticide pressure did not lower DDT lerances significantly after 16 generations in culture. o resistance to azinphos-ethyl has been recorded and tempts to induce resistance to this material have been successful over 16 generations of selection. [From thors' summary.]—Qd Dep. prim. Ind.

57. ANON.
Luring moths to blacklight traps. *Agric. Res., Wash.*, 1965, **13**(10): 15, illus.

n average of 4 male tobacco hornworm moths *rotoparce* sp.] per night was caught in black-light aps. However, when 2, 6 or 10 virgin female moths ere placed within 15 feet of a trap the average catch creased to 13, 24 and 48, respectively.

Harvesting and curing.

58. MIHAJLOV, I., AND ANAKIEV, B.
Labour requirements for harvesting and stringing tobacco and possibilities of planning. [Macedonian, with English summary $\frac{3}{4}$ p.] *Annu. Fac. Agric. Sylvic. Skopje, Agric., 1962-63*, 1963, **16**: 243-60, bibl. 10.

bour for harvesting and stringing amounts to more an one-third of the 6,000 hours required for tobacco oduction on 1 ha. By planning and mechanization tal labour requirements could be reduced to 46·83%, tobacco were sold on the string to 26%, and by option of methods used in burley production in entucky to 14·33% of this figure. Analyses of labour ed for picking and stringing 1 ha. of tobacco showed at, by good organization, 256 hours (11·43%), or, thout a long lunch break, 479 hours (17·71%), could saved.

59. SCOTT, W. A.
Récolte et séchage du tabac burley à cigarettes. **(Harvesting and curing burley cigarette tobacco.)** *Rev. int. Tabacs*, 1965, **40**: 78-9, 96.

French version of *H.A.*, 35: 1620.

60. VIART, P.
Étude du comportement au séchoir de tabacs récoltés suivant diverses modalités. **(A study of the behaviour during curing of tobacco harvested in various ways.)** [English and German summaries $\frac{2}{3}$ p. each.] *Ann. Dir. Ét. Équip. S.E.I.T.A., Sect. 2*,† 1964, **1**: 65-80, bibl. 5.

e study was carried out in 1962 on hybrid F_1 P48 × cks RF 1. The tobacco was harvested by 19 ferent methods. It was found that curing on the lk resulted in lower weight yields than leaf curing. itting the stalks into 2 or 3 sections did not influence the yield. The behaviour differences between stalk cured and leaf cured tobaccos occurred mainly at the start of the curing process. The following leaf harvesting methods gave yields in decreasing order: harvest in 2 stages, lower leaves first; harvest in 3 stages; single harvest. Mixed curing after a 2-stage harvest gave a yield between those of stalk curing and leaf curing. Leaves harvested in either one or two stages had the best physical properties; a 2-stage harvest is recommended as the best method.

8461. HENSON, W. H., JR., JOHNSON, W. H., AND HASSLER, F. J.
The influence of leaf maturity and other factors on the drying rate of bright-leaf tobacco. *Tobacco, N.Y.*, 1965, **160**(23): 26-30, bibl. 6, illus.

Drying rates of immature, mature and over-mature leaves from 3 primings with 0, 24, 48 or 72 hours of pile yellowing were measured and compared. A constant drying condition of 120° F. and 45% R.H. was used. The more mature leaves exhibited drying curves which were curvilinear, whereas the drying curves for the immature samples were straight lines when plotted on semi-log paper. This was consistent with the hypothesis that more mature leaves dry at a greater rate. The immature leaves, in general, followed an exponential law of drying more closely than did mature leaves. Leaf drying rates consistently increased with increasing stalk position. Drying rate differences between the first and third primings were about the same as drying rate differences between immature and over-mature leaves within a priming. The immature leaves showed a decrease in drying rate with increased yellowing, while the drying rate of over-mature leaves was increased by a longer yellowing time. [From authors' abstract.]—Univ. Ky, Lexington, and N.C. St. Coll., Raleigh.

8462. KOGAN, I. S., AND ČENIKOV, V. V.
A study on the process of drying tobacco with an increased moisture content. [Russian.] *Tabak*, 1965, **26**(2): 10-16, illus.

When tobacco in loose bulk was dried without conditioning, the moisture loss was twice as high at the bottom as at the top of the layer. Increasing the R.H. to 60–70% to avoid unequal drying prolonged the drying procedure. A process of conditioning tobacco with a high moisture content, which is described, consisted of 3 stages, viz. drying at 75° C. and R.H. 10%, cooling at 20° and R.H. 60%, and moistening at 55° and R.H. 100%.

8463. LOCHE, J., ALBO, J.-P., AND CHOUTEAU, J.
Évolution des principaux polyphénols du tabac pendant le séchage à l'air naturel. **(The development of the principal polyphenols of tobacco during air curing.)** [English and German summaries $\frac{1}{4}$ p. each.] *Ann. Dir. Ét. Équip. S.E.I.T.A., Sect. 2*,* 1964, **1**: 83-92, bibl. 8, illus.

During a period of 60 days a marked and rapid decrease in chlorogenic acids was observed. Flavonosides, consisting chiefly of rutin, and an unidentified substance with pink fluorescence decreased more gradually. Scopoletin appeared at the yellowing stage and increased as scopolin decreased. A substance exhibiting yellow fluorescence, thought to be a mixture of oxidation products, increased markedly during the period.

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* Formerly *Qd. J agric. Sci.*
† Formerly *Ann. Inst. exp. Tabac Bergerac.*

* Formerly *Ann. Inst. exp. Tabac Bergerac.*

8464. Walker, E. K.
Effect of relative humidity in yellowing flue-cured tobacco under forced-air conditions. *Lighter*, 1965, **35**(1): 16-21, bibl. 6.

Wide variations in R.H. had comparatively little effect on leaf quality in the experiments described. Since quality was usually somewhat lower for R.H.s of 52, 64 and 97% than for 81 and 86% it is concluded that 75–90% is the optimum range. Lower primings were tolerant of a wider range of R.H. than were upper primings. Colour was slightly darker with lower R.H. levels. [For temperature effects see *H.A.*, 32: 3489.]

8465. Walker, E. K.
Fixing the color of flue-cured tobacco under for air conditions. *Tobacco, N.Y.*, 1965, **160**(2 26-32, bibl. 6.

Studies on increasing the temperature and saturat deficit in the colour-fixing phase of the curing process

8466. (Henson, W. H., Jr.)
Camera records tobacco curing. *Agric. R Wash.*, 1965, **13**(11): 16.

The use is reported of time-lapse colour films to rec the rate of colour change in leaves subjected to vari combinations of air temperature, air flow and moist content.

MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS.

Bamboos.

8467. Sindoesoewarno, D.
Penanaman dan penebangan dalam hutan bambu Kalisetail. **(Planting and cutting bamboo in Kalisetail, [Indonesia].)** *Lap. Lemb. Penelit. Kehut.*, 1963, **90**: 5-69, from abstr. in *Indones. Abstr.*, 1964, **6**: 52.

In 3-year-old planted thickets 3 culms per clump could be cut in 1 year. In virgin stands with a selective felling cycle of 1 year *Gigantochloa nigrocillata* gave more culms per clump per year than *Bambusa vulgaris*, *G. verticillata* and *G. verticillata* f. *robusta*. Half clear-cut felling, with a felling cycle of 2 years, was more favourable for *B. vulgaris*. Rejuvenation after clear felling was not promising, as many clumps died off, but *G. apus* rejuvenated well.

Condiment and spice plants.

8468. Georgiev, E.
The effect of climatic conditions on the growth, yield and quality of anise. [Bulgarian, with English and Russian summaries 1 p. each.] *Rasten. Nauki*, 1965, **2**(3): 81-91, bibl. 22.

Pimpinella anisum was grown at 4 altitudes ranging from 155 to 1,030 m. The period between sowing and emergence and the length of the vegetative phase were shortened by higher mean daily temperatures, and lengthened by greater precipitation. At high altitudes wet springs could result in poor, uneven growth and crop failure, and the fruit might not fully ripen owing to the lengthening of the vegetative phase. In the ripening phase lower mean daily temperatures and higher humidity increased the essential oil content of the fruit, whereas the fixed oils and other major constituents were little affected by climatic conditions. Oil yields, however, were mainly dependent on fruit yields which were highest on the plains. [See also *H.A.*, 35: 4115.]—V. Kolarov higher agric. Inst., Plovdiv.

8469. Sindhe, A. N. R.
Cardamom: botany and uses. (A general outlook.) *J. Mysore hort. Soc.*, 1964, **9**(4): 17-21, bibl. 25.

Including a comparison of Malabar, Mysore and Ceylon types.

8470. Pai, R. M.
The floral anatomy of *Elettaria cardamomum* Maton, a re-investigation. *New Phytol.*, 1965, **64**: 187-94, bibl. 16, illus.

The re-investigation indicates that the epigynous gla of the cardamom flower, as in other species of the Zin beraceae, are vascularized emergences of the ova Anatomical evidence has been adduced in support of classical view that the labellum of the cardamom flo is a double structure. It is shown that the mid-anter strand in the labellum is a fusion product of the marg traces of the two component members belonging to inner androecial whorl. [From author's summary. Marathwada Univ., Aurangabad, India.

8471. Raychaudhuri, S. P., and Chatterjee, S.
Aphid transmission of a new mosaic streak dise of large cardamom. Abstr. in *Phytopatholo* 1964, **54**: 904.

The cardamom varieties Ramnok, Ramsai and Chura pha, and *Amomum aromaticum* are susceptible to mosaic disease of the large cardamom (*A. subulatu* causing streaks on the leaves and a reduction in number of flowers. The virus is sap transmissible a wheat and arrowroot were established as alterna hosts. The corn aphid (*Rhopalosiphum maidis*) w shown to be a vector. Six apterous aphids given acquisition feeding period of 5 min. on cardamom a 15–30 min. on wheat transmitted the disease. Tra mission by the aphids from cardamom to cardamom w difficult and the percentage of infection was low co pared with transmission to wheat. In preliminary te aphids collected on peach (tentatively identified *Brachycaudus helichrysi*) and an unidentified spec collected on squash also transmitted the disease fro cardamom to wheat.—I.A.R.I., New Delhi.

8472. Pillai, P. K., and Santhakumari, S.
Studies on the effect of growth regulators on fr setting in cardamom. *Agric. Res. J. Kerala*, 196 3: 5-13, bibl. 32, illus.

Cardamom does not set fruit on the plains of Kera Irradiation of seed with Co^{60} produced plants whi flowered profusely, but no fruit setting was observe GA at 25, 50, 100, 200, 250 and 300 p.p.m. and 2,4-D 2, 5 and 10 p.p.m. were sprayed on the panicles of the plants before anthesis. All the treatments caused increase in panicle length, particularly GA at 50 p.p. Fruit set was induced by GA at 100, 200 and 250 p.p. and by 2,4-D at 2 p.p.m.; GA at 200 p.p.m. was th optimum dose.—Agric. Coll. Res. Inst., Vellayani.

73. Földesi, D., and Sváb, J.
A koriander (*Coriandrum sativum* L.) és a kapor (*Anethum graveolens* L.) vegyszeres gyomirtása és új termesztési technikája. **(Chemical weed control and new cultural practices in coriander and dill.)** *Herba hungarica*, 1964, 3(1): 51-64, from *Hung. agric. Rev.*, 1965, **14**, Abstr. 68.
A koriander (*Coriandrum sativum* L.) és a kapor (*Anethum graveolens* L.) vegyszeres gyomirtása és sűrűsoros vetése. **(Chemical weed control and dense row sowing in coriander and dill.)** [English and Russian summaries ½ p. each.] *Kísérl. Közlem., Sect. C*, 1964 (issued 1965), **57C**(2): 95-105, bibl. 6, illus.

1114 [prometryne] applied at 2·5 to 3·5 kg. per
dastral hold (0·57 ha.) gave satisfactory weed control
coriander and dill without causing crop injury during
oth rainy and dry seasons. Coriander and dill are
ually grown in widely spaced rows to permit manual or
echanical soil cultivation. By effective chemical
eed control the row width could be reduced from 36
12 cm.; this increased yields by 50 to 100% and
ade growing the crop profitable.

74. Raghuvanshi, S. S., and Joshi, S.
Artificial induction of pollen variability in *Anethum* and *Pimpinella*. *Naturwissenschaften*, 1965, **52**: 397-8, bibl. 3, illus.

e application of a new technique [not described in
is paper] for inducing polyploidy led to variations in
llen grains, including asymmetry and large size.—
niv. Lucknow.

75. Sehgal, C. B.
Artificial induction of polyembryony in *Foeniculum vulgare* Mill. *Curr. Sci.*, 1964, **33**: 373-5, bibl. 2, illus.

varies excised 7 days after pollination were cultured on
basal medium supplemented with one of the following:
and 10 p.p.m. IAA; 10% autoclaved coconut milk;
0 and 500 p.p.m. casein hydrolysate; 100 and 500
p.m. yeast extract; and casein hydrolysate+yeast
tract. Only monoembryonic seeds were produced on
e first 2 named media; polyembryony was induced in
% of the ovules in the remaining media.—Univ.
elhi.

76. Patel, G. J., and Jaisani, B. G.
Effect of pre-soaking treatment and stage of harvest on the germination of fennel seed. *Indian J. Agron.*, 1964, **9**: 261-7, bibl. 3, illus.

aking the seed in water for 1, 2, 3, 4 or 5 days hastened
rmination, and the 5-day treatment gave the best
sult. Seeds dried on the mother plant, green seeds,
xed seeds and shrivelled seeds were found to have
rminated 100%, 93%, 92% and 79%, respectively, 7
ys after planting.—Inst. Agric., Anand.

77. Kannan, K., and Nair, K. P. V.
***Zingiber officinale* (ginger) in Kerala.** *Madras agric. J.*, 1965, **52**: 168-76, illus.

gh-yielding varieties selected for general distribution
clude Rio de Janeiro, yielding 25,000–30,000 kg./ha.,
d China, yielding 18,000–20,000 kg./ha. Indigenous
rieties are also mentioned. In planting trials yields
re increased by 100–200% by planting in the first
ek of April instead of in May or June. The applica-
n of green leaf mulch immediately after planting and
ain about 6 weeks later, using a total of 20,000 kg.
ves/ha., resulted in a 200% increased yield over the
non-mulched crop. Standardized methods are proposed for curing and for the storage of seed material in aerated pits after immersion for 30 minutes in 0·25% wettable Ceresan solution. The immersion treatment is an aid to controlling soft rot caused by *Pythium aphanidermatum* and *Sclerotium rolfsii*. Soft rot in the field is controlled by drenching with Cheshunt compound. Stem borer, the only serious pest, is controlled by 0·05% endrin spray. The economics of cultivation are discussed.—Agric. Res. Stat., Ambalavayal, Kerala.

8478. Lokanath, M., and Dash, N. K.
Determination of optimum spacing, fertilization and method of planting for ginger (*Zingiber officinale* Rosc.). *Indian J. Agron.*, 1964, **9**: 281-5, bibl. 8.

A spacing of 6×6 in. was found to give a higher yield than 9×9 or 12×12 in. irrespective of the planting method adopted. Planting on flat beds subsequently converted to ridge beds gave a significantly higher yield than either flat or ridge planting alone. In a factorial fertilizer trial the combination of 60 lb. N, 40 lb. P and 60 lb. potash applied in 2 split doses was found to be best.—Dep. Agric., Orissa.

8479. Holmes, F. O.
Elimination of turnip mosaic virus from a stock of horseradish. *Phytopathology*, 1965, **55**: 530-2, bibl. 10.

A full account of work abstracted in *H.A.*, 35: 4124.

8480. Lossner, G. S.
Die Inhaltsstoffe von *Majorana hortensis* Moench. 1. Mitteilung: Die Lipoide. **(The contents of *Majorana hortensis*. 1st Report: The lipoids.)** *Pharmazie*, 1965, **20**: 224-8, bibl. 10, illus.

Methods of extraction, chromatographic fractionation and crystallization from leaves and stems are described, and the presence shown of 18·2% n-triakontane and 4·6% β-sistosterine in the lipoid fractions from the leaves.

8481. Alim, A., and Haq, A.
Study on the performances of West Pakistan mustards in East Pakistan. *Agric. Pakist.*, 1964, **15**: 121-4.

The varieties Raya L-18 and Toria A from West Pakistan were compared for 2 years with the East Pakistan varieties Rai 5 and Tori 7. Raya L-18 ripened late and yielded poorly. Toria A, although more satisfactory, gave only half the yield of Rai 5.—Dalla cent. Res. Stat.

8482. Krickl, M.
Untersuchungen über die Schwankungen im 1000-Korn-Gewicht, in der Keimfähigkeit und der Keimdauer bei Petersilie, *Petroselinum crispum* (Mull.) Nym. **(Investigations on variations in the 1,000-seed weight, viability and longevity of parsley seed.)** *Saatgut-Wirtsch.*, 1965, **17**: 119-23, 153-7, bibl. 3.

Selected strains, of which the origin is given, were compared annually on 3 different sites. The results show the percentage of samples with over 61% and 81% germination, and also the percentage of seeds smaller than 0·9 mm. although such seed was excluded from the tests. The 1,000-seed weight ranged from 0·84–1·35 g. Results varied considerably, possibly due to weather conditions, especially rainfall, which affects the time taken for flowering and seed development. Well-rooted plants with high quality seed were used for selection each year, but wide variation in the results made assessment of improvement difficult. There were, however, indications of a tendency towards improvement in longevity.

8483. MENDICINO, J., AND PICKEN, J. M.
The biosynthesis of the branched chain sugar D-apiose in *Lemma* and parsley. *J. biol. Chem.*, 1965, **240**: 2797-805, bibl. 35, illus.

8484. ATAL, C. K., AND OJHA, J. N.
Studies on the genus *Piper*. Part IV. Long peppers of Indian commerce. *Econ. Bot.*, 1965, **19**: 157-64, bibl. 25, illus.
History, uses and chemical composition are reviewed. *P. longum*, *P. peepuloides*, *P. retrofractum*. *P. officinarum* and a variety thought to be derived from a sterile race of *P. longum* are described, with details of the cultivation, collection and geographical sources of each.—Punjab Univ., Chandigarh, India.

8485. INSTITUT DE RECHERCHES AGRONOMIQUES TROPICALES ET DES CULTURES VIVRIÈRES.
La multiplication du poivrier. **(The propagation of pepper.)** *Cah. Agric. prat. Pays chauds*, 1965, No. 1, pp. 41-2.
Raising *Piper nigrum* from seed or by marcottage or grafting is briefly discussed. Success of the order of 70–90% is normally obtained by using cuttings of orthotropic one-year-old wood which are about 60 cm. long and bear 5–7 nodes. They may be planted directly in the field.

8486. RUPPEL, E. G., AND ALMEYDA, N.
Susceptibility of native *Piper* species to the collar-rot pathogen of black pepper in Puerto Rico. *Plant Dis. Reptr*, 1965, **49**: 550-1, bibl. 6.
To determine the suitability of native *Piper* species as rootstocks for black pepper, *P. aduncum*, *P. blattarum*, *P. citrifolium*, *P. scabrum* and *P. treleaseanum* were inoculated with the species of *Phytophthora* which causes collar rot. All were susceptible to some extent; however, *P. aduncum* exhibited a high degree, and *P. scabrum* and *P. treleaseanum* a lesser degree, of resistance. [From authors' abstract.]

8487. BRIESKORN, C. H., AND GLASZ, J.
Salvia-Glykoproteid, ein wasserlöslicher Eiweissstoff aus den Samen von *Salvia officinalis* L. 19. Mitteilung: Über die Inhaltstoffe von *Salvia officinalis* L. **(Salvia glycoprotein, a water-soluble protein from the seed of *Salvia officinalis*. 19th Report: Constituents of *Salvia officinalis*.)** *Pharmazie*, 1965, **20**: 382-4, bibl. 7.
For earlier papers on the constituents of *S. officinalis* see *H.A.*, 33: 5747 and 34: 5378.

8488. FIESTER, D. R., AND ELLIOTT, R. C.
Recomendaciones para la explotación de vainilla en Guatemala. **(Recommendations for the cultivation of vanilla in Guatemala).** *Bolt. téc. Inst. agropec. nac.*, 1964, No. 9, pp. 1-36, from *Trop. Abstr.*, 1965, **20**, Abstr. n1634.
The subjects discussed are the ecological requirements of the crop, the establishment and maintenance of a plantation, vegetative propagation, manual pollination, harvesting, 3 methods of curing (on the ground, with hot water and in a heated drier) and grading. The only serious disease is root-rot caused by *Fusarium batatis* var. *vanillae*, which can largely be prevented by limiting plantations to well-drained soils. A detailed calculation of costs and profits, based on a yield of 1,300 kg./h in 5 years, is appended. [See also *H.A.*, 35: 4134.]

8489. FIESTER, D. R., AND ELLIOTT, R. C.
La vainilla. Condiciones del mercado en l
Estados Unidos de Norte América. Su cultivo
beneficio en México. **(Vanilla. Market cond
tions in the U.S.A. Its cultivation and curing
Mexico.)** *Bol. téc. Inst. agropec. nac.*, 1964, N
10, pp. 1-11, from *Trop. Abstr.*, 1965, **20**, Abst
n1633.
The second part briefly discusses the vanilla-growin
regions of Mexico and the methods of cultivatio
processing and grading. The commonly practise
method of curing in a sweat box is said to yield a bette
quality product than does curing with heated air.

Drug plants.

(*See also* 6877, 8163.)

8490. SEVILLA SANTOS, P., LAT, B. S., AND PALO, M. A
The antibiotic activities of some Philippine lichen
Philipp. J. Sci., 1964, **93**: 325-33, bibl. 23.
Antibiotic properties were shown by 30 of the 33 speci
investigated.—Nat. Inst. Sci. Tec., Manila. [See *H.A*
33: 5757 for a similar investigation in Bulgaria.]

8491. HULTIN, E., AND TORSSELL, K.
Alkaloid-screening of Swedish plants. *Phyt
chemistry*, 1965, **4**: 425-33, bibl. 80.
Using a semi-quantitative method for determining th
alkaloid concentration in dried plant material, 200 wi
and cultivated plants were examined; the results ar
tabulated under families.—Univ. Stockholm.

8492. GROVER, N.
Man and plants against pain. *Econ. Bot.*, 196
19: 99-112, bibl. 91.
A survey of plants possessing analgesic properties
including notes on mandrake, belladonna, opium poppy
hemp and coca.

8493. CHOPRA, M. M., VASHIST, V. N., AND HANDA
K. L.
**Chromatographic estimation of asarones in India
Acorus calamus Linn. oil (tetraploid variety).** *J.
Chromatog.*, 1965, **17**: 195-6, bibl. 7.
Oils distilled in 1963 and 1964 contained 80·7 an
79·9% of asarone, respectively.

8494. FERREIRA, M. A., PRISTA, L. N., AND ALVES, A. C
Ensaios sobre as raízes de *Alchornea cordifoli*
(Schumach) Muell. Arg. **(Investigations on the
roots of *Alchornea cordifolia*.)** [French an
English summaries 12 and 14 lines.] *Garcia d
Orta*, 1963, **11**: 265-74, bibl. 12.
A botanical description is given of the shrub which has
many local medicinal uses. The roots were found to
contain one or more alkaloids (one of them somewhat
resembling yohimbine) and two organic acids, namely
anthranilic and genistic acids.

8495. HRUBAN, L., AND ŠANTAVY, F.
Polarographie der Aristolochiasäure. **(Polaro-
graphy of the acid in *Aristolochia* spp.)**
Pharmazie, 1965, **20**: 357-8, bibl. 11, illus.
From the seeds and roots of *Aristolochia clematis*,
A. rotunda, *A. longa* and *A. sipho*.

96. Gracza, L.
Über die Wirkstoffe von *Asarum europaeum* L. 4. Mitteilung: Kohlenhydrate. **(Metabolites in *Asarum europaeum*. 4th Report: Carbohydrates.)** *Pharmazie*, 1965, **20**: 228-9, bibl. 13, illus.

uantitative determination of starch, cellulose and gars present in leaves and rhizomes after flowering, d demonstration of the presence of glucose, fructose d saccharose. [For part 3 see *H.A.*, 35: 4151.]

97. Nair, A. G. R., and Subramanian, S. S.
(±) Leucocyanidin from the seedcoat of *Calophyllum inophyllum* Linn. *Curr. Sci.*, 1964, **33**: 336-7, bibl. 4.

e isolation is reported of the two forms, in apparently ual proportions.—Med. Coll., Pondicherry.

98. Wagner, H., Hörhammer, L., and Münster, R.
Über die Struktur eines neuen Flavonoids aus den Früchten von *Carduus marianus* L. (Mariendistel). **(Structure of a new flavonoid from the fruits of *Carduus marianus*.)** *Naturwissenschaften*, 1965, **52**: 305, bibl. 3.

amed silybin.

99. Lemli, J.
Densitometric determination of anthra-glycosides in leaves, pods and drug preparations of senna. [Flemish?] *Verh. Koninkl. Vlaam. Acad. Geneesk. Belg.*, 1963, **25**: 458-72, from *Analyt. Abstr.*, 1965, **12**, Abstr. 1357.

00. El Khadem, H., and Abdel Rahman, M. M.
Heptacosan-l-ol from the fruit of *Citrullus colocynthis*. *J. chem. Soc. Lond.*, 1965, pp. 3488-9, bibl. 4.

is higher alcohol has now been extracted from the lp [see also *H.A.*, 34: 3453].

01. Tyihák, E., Pályi, I., and Pályi, V.
Die Isolierung der Germakranolide für die biologischen Untersuchungen. **(Isolation of bitter principles in biological investigations.)** *Naturwissenschaften*, 1965, **52**: 209, bibl. 5.

lumn-chromatography revealed the presence of the bitter principles, cnicinolide, benedictinolide, benetin and cnicin, in *Cnicus benedictus* and of the 2 st-mentioned substances in *Arctium lappa*.—Inst. ilpflanzenforsch., Budapest.

02. Parekh, A. V., and Rao, V. S.
Chemical composition of *Cressa cretica* Linn. and *Salicornia brachiata* Roxb. *Curr. Sci.*, 1965, **34**: 247-9, bibl. 7.

bulated data including micronutrients.

03. Sosa, C.
Estudio fitoquímico de *Croton menthodorus* (mosquera). **(Phytochemical study of *Croton menthodorus*.)** *Cienc. Nat.*, 1964, **7**: 69-73, bibl. 9.

alysis revealed the presence of fixed oil (10%) and tonilic acid in the seeds, a croton resin in the seeds, ms and leaves, and a flavonoid pigment and a phenolic mpound in the leaves.

04. Chládek, M.
Výzkum nového typu durmanu bezostného (*Datura stramonium* L. var. *inermis* [Jacq] Timm). **(Studies on a new type of thornless thornapple.)** [English, Russian and German summaries ⅓ p. each.] *Bull. vyzk. Úst. zelin., Olomouc*, 1964, **8**: 219-30, bibl. 31, illus.

Crossing *Datura stramonium* with *D. stramonium* var. *inermis* gave a new type, named PG-59, which is distinguished by a tall habit, large, light green leaves and thornless, late maturing fruits. PG-59 produced 2,360 kg./ha. of leaves containing on average 56% more alkaloids than a local variety, and showed less damage from *Alternaria crassa*.

8505. Novák, V.
Příspěvek k přímým výsevům náprstníku vlnatého *Digitalis lanata* Ehr.). **(A contribution on the method of direct sowing of foxglove.)** [English, Russian and German summaries 4 lines each.] *Bull. výzk. Úst. zelin., Olomouc*, 1964, **8**: 231-5, bibl. 3, illus.

Digitalis lanata sown in the field in the autumn or early spring produced higher yields of medicinal raw material per unit area than did transplants.

8506. Calcandi, V., Calcandi, I., and Lungeanu, I.
Über die Glykoside von *Digitalis parviflora* Jacq. und *Digitalis mertonensis* Buxt. et Darl. **(The glycosides of *Digitalis parviflora* and *Digitalis mertonensis*.)** *Pharmazie*, 1965, **20**: 43-4, bibl. 29.

Methods of extraction are described in detail. In studies using paper chromatography lanatosides A, B and E and strospeside were demonstrated in *Digitalis parviflora* and *D. mertonensis*; verodoxin was present only in the latter. A short survey is also given of the cardiac glycosides which have been shown to be present in *Digitalis lutea*, *D. ferruginea*, *D. viridiflora*, *D. purpurea* ssp. *heywoodii* and *D. grandiflora*. The name desacetyllanatoside E is proposed for glucogitaloxin.

8507. Wolf, L., and Karacsony, E. M.
Inactivation of enzymes in the extraction of *Digitalis lanata* glycosides, and paper-chromatographic determination of the glycosides. *Plant. med.*, 1963, **11**: 432-8, from *Analyt. Abstr.*, 1965, **12**, Abstr. 2932.

8508. Corona, G. L., Rondanelli, R., and Mascherpa, A.
Column-chromatographic fractionation of digitalis glycosides. [Italian.] *Farmaco. Ed. Prat.*, 1963, **18**: 549-57, from *Analyt. Abstr.*, 1965, **12**, Abstr. 1356.

From *Digitalis lutea* and *D. lanata*.

8509. Luckner, M., Bessler, O., and Schröder, P.
Vorschläge für den Drogenteil des DAB 7. 5. Mitteilung: Radix Gentianae. **(Suggestions regarding the medicinal component of DAB 7. 5th Report. Radix gentianae.)** *Pharmazie*, 1965, **20**: 16-19, bibl. 51.

The sources of the raw material are the roots and rhizomes of *Gentiana lutea*, *G. pannonica*, *G. purpurea*, *G. punctata* and *G. asclepiadea*. Descriptions are given of the preparation, qualitative and quantitative determination, properties, storage, effect and use of radix gentianae and the structure of the bitter substances contained in it.

8510. Monkovič, I., and Spenser, I. D.
Biosynthesis of berberine and berberastine. Incorporation of catecholamines. *Canad. J. Chem.*, 1965, **43**: 2017-26, bibl. 29.

Dopamine serves as a precursor of berberastine, berberine, hydrastine and canadine in *Hydrastis canadensis*.

Noradrenaline serves as a precursor of berberastine, but is not incorporated into the other 3 bases. It is shown that the incorporation of labelled dopamine into berberine and of labelled noradrenaline into berberastine takes place without randomization of radioactivity. [Authors' abstract. See also *H.A.*, 35: 6358.]—McMaster Univ., Hamilton, Ont.

8511. Swamy, A. V., Kalyanasundaram, S., and Balagopal, M.
The plant that gives us jalap. *Indian Fmg*, 1965, **14**(12): 30-1.

The morphology and cultivation are described of *Ipomoea purga*. The percentages of resins and starch found in local tubers varied from 11·35–21·5% and 25·75–42·91%, respectively. A direct relationship between weight of tuber and resin content was not found, though lighter tubers tended to have a higher resin content than heavier ones.—Cinchona Dep., Ootacamund, and I.C.A.R., Dodabetta.

8512. Hylin, J. W., and Watson, D. P.
Ergoline alkaloids in tropical wood roses. *Science*, 1965, **148**: 499-500, bibl. 6.

The seeds of *Ipomoea tuberosa*, *I. purpurea* varieties Pearly Gates and Heavenly Blue and *Argyreia nervosa* were analysed. The principal alkaloids found in *A. nervosa* and the *I. purpurea* cultivars were ergine, isoergine and penniclavine. The seed of *A. nervosa* is the best plant source of ergoline alkaloids yet discovered, containing about 3 mg. of alkaloidal material per g. of seed, of which one-eighth is lysergamide.—Univ. Hawaii, Honolulu.

8513. Pereira, A., Jr., and Godinho, L. S.
Estudo de *Maytenus senegalensis* (Lam.) Exell. I. Isolamento e identificação do triterpenóide olean-12-en-3β-ol (β-amirina). **(Study of *Maytenus senegalensis*. I. Isolation and identification of the triterpenoid, olean-12-en-3β-ol (β-amyrin.)** [French and English summaries 15 lines each.] *Garcia de Orta*, 1963, **11**: 465-76, bibl. 52, [received 1965].

This species came from Angola and Mozambique, but a Brazilian species, *M. illicifolia*, contained no triterpenoids.

8514. Ferreira, M. A., Alves, A. C., and Prista, L. N.
Estudo químico da *Newbouldia laevis* Seem. 1. Isolamento de bases indólicas. **(Chemical study of *Newbouldia laevis*. 1. Isolation of indolic bases.)** [French and English summaries 12 lines each.] *Garcia de Orta*, 1963, **11**: 477-86, bibl. 6, [received 1965].

Roots from Portuguese Guinea contained 4 indole alkaloids.—Fac. Farm., Porto.

8515. Williams, L.
Growing ginseng. *Fmrs' Bull. U.S. Dep. Agric.* **2201**, 1964, pp. 11, illus.

Details of the planting materials of American ginseng (*Panax quinquefolius*), its culture and harvest are given. Diseases caused by *Alternaria panax*, *Phytophthora cactorum*, *Verticillium albo-atrum*, *Thielaviopsis basicola*, *Sclerotinia* spp., *Ramularia* sp. and damping-off, papery leaf spot and root knot are discussed.

8516. Grušvickij, I. V.
The effect of gibberellin on the germination seeds and development of juvenile plants of ginsen [Russian, with English summary 10 lines.] *Iz* *Akad. Nauk SSSR, Ser. biol.*, 1965, No. 3, p 423-7, bibl. 3, illus.

Two applications of 0·01% gibberellin to ginseng plan during fruit set slightly increased the size of the embry but had no effect on germination. Treatment ginseng seeds with 0·025 or 0·05% gibberellin befo warm stratification stimulated embryo development an reduced the time required for warm stratification from to 2 months. Treatment of seeds that had already bee warm stratified for 4 months with 0·025 or 0·05 gibberellin induced germination after only 2 months subsequent cold stratification instead of the usual months and also accelerated seedling developmen Treatment of seeds that had been warm stratified for months and then cold stratified for 4 months with 0·05 gibberellin hastened germination and seedling growt inducing in some plants the premature formation of second shoot. [See also *H.A.*, 35: 4812.]

8517. Grupče, R.
The effect of temperature on the germinati of *Papaver somniferum*. [Macedonian, wi English summary ½ p.] *Annu. Fac. Agric. Sylv* *Skopje, Agric., 1961-62*, 1962, **15**: 247-58, bibl.

Seeds of white and blue poppy germinated at tempe tures ranging from 1° to 30° C; emergence was m rapid at 20°–25°. Older seedlings were less affected extreme temperatures than newly emerged seedling The daily growth increment was greater in blue poppi var. *violascens*, than in white poppies, var. *albescen*

8518. Tétényi, P., and Lőrincz, G.
A mák fajon belüli kémiai taxonjai. (**Intr specific chemical taxa of poppies.**) [English ar Russian summaries ¾ p. each.] *Kísérl. Közlem* *Sect. C*, 1964 (issued 1965), **57C**(2): 75-93, bib 31.

The main alkaloid in samples of poppy varieties wa morphine; codeine, thebaine and papaverine occurre less frequently and in smaller quantities. In mo samples papaverine and papaverine plus thebaine we absent or occurred only in traces. These differences i alkaloid level and composition were found to hereditary and 8 races, chemovars, were characterize on this basis. Observations revealed no definite rela tionships between morphological features and alkalo content, although the races could be morphological characterized.

8519. Schröder, H.
Untersuchungen über Veränderungen des Mo phingehalts reifender Mohnkapseln. (**Studies o changes in the morphine content of ripening popp capsules.**) *Pharmazie*, 1965, **20**: 169-71, bibl. 1

The highest absolute and relative values for morphi contents of poppy capsules were reached 10–12 day before seed ripening. These high values were mai tained if the weather was dry during the subsequent weeks, but fell sharply if it was wet. Seed yield protein and oil contents were not reduced by harvestin 10–12 days earlier than usual, but the value of such see for sowing will need investigation.

20. Kühn, L., and others.
Über die Alkaloide von *Papaver caucasicum* Marsch.-Bieb. **(The alkaloids of *P. caucasicum*.)** *Naturwissenschaften*, 1964, **23**: 556, bibl. 6.
Pfeifer, S., and Kühn, L.
Zur Kenntnis der Alkaloide von *Papaver caucasicum* Marsch.-Bieb. **(More information about the alkaloids of *P. caucasicum*.)** *Pharmazie*, 1965, **20**: 394-5, bibl. 15.

ne alkaloids have been identified in *P. caucasicum.*

21. Pfeifer, S., and Hanuš, V.
Zur Kenntnis der Alkaloide von *Papaver rhoeas* L. **(More information about the alkaloids of *Papaver rhoeas*.)** *Pharmazie*, 1965, **20**: 394, bibl. 20.

nactine, hitherto known only in *Sinomenium acutum* d *Fumaria officinalis*, has now been identified in *rhoeas*. [For other studies on *Papaver* alkaloids *H.A.*, 35: 4184 and earlier.]

22. Battersby, A. R., Foulkes, D. M., and Binks, R.
Alkaloid biosynthesis. Part VIII. Use of optically active precursors for investigations on the biosynthesis of morphine alkaloids. *J. chem. Soc. Lond.*, 1965, pp. 3323-32, bibl. 28.

Papaver somniferum.

23. Kovács, P., and Jindra, A.
Biosynthesis of alkaloids. On the oxidative deamination of biogenetically important amino acids in *Papaver somniferum* plants. *Naturwissenschaften*, 1965, **52**: 395-6, bibl. 8.

24. Trojánek, J., and others.
Isolierung von Morphin aus Mohnkapseln. 1. Mitteilung: Untersuchungen zur Extraktion von Morphin aus Mohnkapseln (vgl. hierzu [46]). **(The isolation of morphine from poppy capsules. 1st Report: Studies on the extraction of morphine from poppy capsules (cf. item 46 of bibliography).)** *Pharmazie*, 1965, **20**: 172-5, bibl. 48.

e best extractant was ammoniacal methanol.

25. Kavka, F., Trojánek, J., and Čekan, Z.
Isolierung von Morphin aus Mohnkapseln. 2. Mitteilung: Statik und Dynamik der Adsorption und Desorption des Morphins an Kationenaustauschern. **(Isolation of morphine from poppy capsules. 2nd Report: Statics and dynamics of adsorption and desorption of morphine on cation exchange agents.)** *Pharmazie*, 1965, **20**: 220-4, bibl. 40, illus.

sts for the determination of optimum conditions for adsorption of morphine are described.

26. Pfeifer, S.
Über das Vorkommen von Glaudin in Opium und *Papaver rhoeas* L. **(The occurrence of glaudine in opium and *Papaver rhoeas*.)** *Pharmazie*, 1965, **20**: 240, bibl. 11.

all quantities were isolated but not crystallized. nute amounts of papaverrubine B and C were also nd in opium. [See also *H.A.*, 35: 4184, 4185.]

27. Pfeifer, S., and others.
Zur Struktur der Papaverrubine. Massenspektrometrie von Rhoeadin-Alkaloiden. **(The structure of *Papaver* rubines. Mass spectrometry of rhoeadine alkaloids.)** *Pharmazie*, 1965, **20**: 45-6, bibl. 6.

Structure and fragmentation processes, analagous to those of rhoeadine, are described. [See also *H.A.*, 35: 4184.]

8528. Shimizu, Y., and Pelletier, S. W.
Cyclosenegenin, a derivative of senegenin in *Polygala senega*. *J. Amer. chem. Soc.*, 1965, **87**: 2065-6, bibl. 12.

This sapogenin was obtained by mild hydrolysis.

8529. Cornett, G. B. R.
***Rauvolfia serpentina*.** [French and Spanish summaries 15 lines each.] *World Crops*, 1965, **17**(2): 33-7, bibl. 13, illus.

The climate and soil needs of the plant are briefly discussed and an account is given of the establishment of a station in Mexico to investigate the problems of growing *R. serpentina*. Details are given of the methods used for propagation (by root, stem, stem tip and node cuttings and by seeds), field practices, diseases and pests, and clonal selection.

8530. Nair, P. K. K., and Kaul, K. N.
Pollen grains in a "gigantic" plant of *Rauwolfia serpentina*. *Curr. Sci.*, 1965, **34**: 256-7, bibl. 3, illus.

An abnormal specimen, 10 ft. tall, was characterized by the large size of some of the pollen grains, a high percentage of pollen sterility and low pollen production.

8531. Bhaduri, P. N., and Biswas, P. K.
Increasing root yield of *Rauvolfia serpentina* by colchiploidy. *Sci. and Cult.*, 1965, **31**: 197-200, bibl. 10.

Auto-tetraploid plants produced by colchicine treatment were multiplied by stem cuttings and the roots harvested after 4 years. The yield was considerably greater than that from diploid control plants, although variations were more marked. The increase in fresh weight of tetraploid roots was not correlated with the moisture content. The total alkaloid in tetraploid roots was significantly greater than in diploid roots; the reserpine content did not increase proportionally, but the steroid content was greater. Propagation by stem cuttings was carried out with the aid of 3-IBA at 5,000 and 10,000 p.p.m. The lower concentration gave the greatest percentages of successfully rooted cuttings, viz. 75·5% diploid and 73·4% tetraploid.—Presidency Coll., Calcutta.

8532. Lemli, J., and Cuveele, J.
Nouveaux hétérosides de l'écorce fraîche de *Rhamnus frangula* L. **(New heterosides in the fresh bark of *Rhamnus frangula*.)** *Pharmazie*, 1965, **20**: 396, bibl. 4.

The following compounds were isolated: emodindianthrone bisrhamnoside, emodin monorhamnoside (frangulin), emodindianthrone monorhamnoside, palmidin C monorhamnoside, emodin and chrysophanol.

8533. Nieschulz, O., and Schneider, G.
Pharmakologische Befunde an Alkaloiden aus *Ruta graveolens* L. **(Pharmacological reports on alkaloids in *Ruta graveolens*.)** *Naturwissenschaften*, 1965, **52**: 394-5, bibl. 4.

Properties of the total alkaloids, skimmianine and γ-fagarine. [See also *H.A.*, 35: 4195.]

8534. Schneider, G.
Isolierung von γ-Fagarin aus *Ruta graveolens* L. **(Isolation of γ-fagarine from *R. graveolens*.)** *Naturwissenschaften*, 1965, **52**: 347, bibl. 7.

8535. Novák, I., and others.
Die Isolierung weiterer spasmolytischer Substanzen aus der *Ruta graveolens* L. **(Isolation of further anti-spasmodic substances from *Ruta graveolens*.)** *Naturwissenschaften*, 1965, **52**: 263, bibl. 3.

It was recently reported [*H.A.*, 35: 4195] that several crystalline fractions had been obtained in the isolation of the anti-spasmodic agents of *Ruta graveolens*. These also proved to be active.—Pharmakog. Inst. med. Univ., Szeged.

8536. Borkowski, B., and Drost, K.
Alkaloide aus *Salicornia herbacea* L. **(Alkaloids from *Salicornia herbacea*.)** *Pharmazie*, 1965, **20**: 390-3, bibl. 29.

Of 4 compounds isolated two were found to be new alkaloids.

8537. Magnus, K. E., and Seaforth, C. E.
***Samanea saman* Merrill: the rain tree. A review.** *Trop. Sci.*, 1965, **7**: 6-11, bibl. 24, illus.

Including data on pharmacologically active constituents and an analysis of the sap.

8538. Džemuhadze, K. M., and Azovcev, G. R.
The catechins of burnet (*Sanguisorba* L.). [Russian.] *Doklady Akad. Nauk SSSR*, 1965, **161**: 715-17, bibl. 3.

Chromatographic studies are described, which showed (+)-gallocatechin and (+)-catechin to be present in the underground organs, and (+)-catechin in the inflorescences of *Sanguisorba officinalis*, *S. alpina*, *S. parviflora* and *S. tenuifolia*.

8539. Tréfás, L., and Nagy, F.
A madárcsucsor (*Solanum laciniatum* Ait.) gépi betakarítása. **(Mechanical harvesting of *Solanum laciniatum*.)** [English and Russian summaries $\frac{1}{4}$ p. each.] *Kisérl. Közlem., Sect. A*, 1964 (issued 1965), **57A**(2): 95-110, bibl. 10, illus.

Of 5 machines tested the best results were obtained with a tractor-drawn modified Mählader mowing-loading machine. A suitable planting distance for mechanical harvesting was 40 cm. in double rows spaced 90+50 cm. apart. With the MTZ-5 tractor at full speed 5 cadastral holds [approximately 7 acres] were cleared in a 10-hour working day. Losses amounted to 6·5% of the total crop. The content of the active principle (solasodine) in the mechanically harvested crop was 9·42% compared with 9·24% in the manually harvested crop, and harvesting costs were 31% lower.

8540. Bognár, R., and Makleit, S.
Steroidalkaloidglykoside 8. Mitteilung: Zusammenfassung der eigenen bisherigen Untersuchungsergebnisse über das Vorkommen von Steroidalkaloidglykosiden in Pflanzen der Gattung *Solanum*. **(Steroid alkaloid glycosides. 8th Report. Summary of results of specific investigations to date on the occurrence of steroid alkaloid glycosides in plants of the genus *Solanum*.)** *Pharmazie*, 1965, **20**: 40-2, bibl. 55.

Methods for the extraction, isolation and purification of alkaloid glycosides, including chromatographic separation, are described, and the quantity and type of alkaloid glycosides found in 52 *Solanum* species and varieties, together with the year of investigation and relevant literature, are tabulated.

8541. Guseva, A. R., and others.
Determination of steroid glycoalkaloids in *Solan* *laciniatum*. [Russian, with English summar lines.] *Biohimija*, 1965, **30**: 260-4, bibl. 14, ill

A method is proposed for the quantitative determi tion of glycoalkaloids in the leaves of *S. laciniat* based on colour reaction with Marquis reagent. F the separate determination of solasonine, solamargi solanine and chaconine thin-layer chromatography silica gel was used. The level of glycoalkaloids r during the growing period and in all samples the cont of solamargine exceeded that of solasonine.

8542. Grossert, J. S., and others.
The indole alkaloids. Part III. The isolation diaboline, and three new alkaloids, henningsami henningsoline, and rindline from *Strychnos h* *ningsii* Gilg. *J. chem. Soc. Lond.*, 1965, pp. 28 14, bibl. 8.

From the bark.

8543. Bisset, N. G.
Structure of retuline, an alkaloid from *Strynch* *holstii* Gilg. *Chem. and Ind., Lond.*, 1965, N 24, pp. 1036-7, bibl. 10.

8544. Yankoulov, Y., and Delčev, G.
Experiments to determine the best method propagating *Valeriana officinalis* L. [Bulgari with English and Russian summaries $\frac{2}{3}$ p. eac *Rasten. Nauki*, 1965, **2**(2): 93-100, bibl. 29, il

Of the 8 variants of 3 methods of propagation test the highest yields of dry roots (3,099 kg./ha.) w obtained by sowing freshly gathered seed in summ wintering in cold beds and planting out. Low prod tion costs and the prevention of mass fungal infecti are claimed for this method.

8545. Grabovský, J.
Příspěvek k agrotechnice kozlíku lékařské (*Valeriana officinalis* L.). **(A contribution on t technique of cultivating *Valeriana officinal*** [English, Russian and German summaries $\frac{1}{4}$ each.] *Věd. Práce výzk. Úst. zelin. v Olomou* 1964, **3**: 205-11, bibl. 13, illus.

In a series of experiments 5 methods of sowing a planting out, 3 spacings and 6 methods of harvesti were tested. The highest yields were obtained wi valerian grown as an annual crop sown in the glassho in the winter (before 15 January) and planted out in t spring (before 1 April) at a spacing of 30×30 c Harvesting with a tractor-drawn potato digger w more economical than by hand or horse-drawn imp ments.

8546. Tomko, J., and Vassová, A.
Alkaloide aus *Veratrum album* subsp. *lobelian* Bernh. Suessenguth. 9. Mitteilung: Isolieru einiger neuer Alkaloide. **(Alkaloids from *Ver* *trum album* subsp. *lobelianum*. 9th Repo Isolation of some new alkaloids.)** *Pharmaz* 1965, **20**: 385-7, bibl. 11.

8547. Svoboda, G. H., and others.
Symposium [on the alkaloids of *Catharanthus* a allied genera]. *Lloydia*, 1964, **27**: 275-485, bib illus.

The whole of this number (No. 4) is devoted to t alkaloids of the Apocynaceae and includes the followi papers: The current status of *Catharanthus rose* (*Vinca rosea*) research, by G. H. Svoboda (pp. 275-

e also *H.A.*, 33: 1476]; *Catharanthus roseus* (*Vinca*
ea)—the importance and value of a chance observa-
n, by R. L. Noble (pp. 280-1); The taxonomy of the
iera *Vinca*, *Lochnera* and *Catharanthus*, by J. D.
vyer (pp. 282-5); Some chemotaxonomic considera-
ns in the Apocynaceae, by R. F. Raffauf (pp. 286-98);
idies on *Catharanthus* alkaloids. VI. Evaluation by
ans of thin-layer chromatography and ceric ammo-
m sulphate spray reagent, by N. R. Farnsworth and
iers (pp. 302-14); Amaryllidaceae alkaloid formation
floral primordial tissue and callus tissue, by R. J.
iadolnik (pp. 315-21); Tissue culture studies of
tain members of the Apocynaceae [*Vinca rosea*,
tonia constricta and *Apocynum cannabinum*], by A. L.
rris, H. B. Nylund and D. P. Carew (pp. 322-7);
sue culture studies of *Catharanthus roseus* crown gall,
G. B. Boder and others (pp. 328-33); Microbiological
iversion of *Catharanthus* alkaloids, by G. E. Mallett,
S. Fukuda and M. Gorman (pp. 334-9); Preparation
l activities of chemically modified dimeric *Catharan-*
s alkaloids, by W. W. Hargrove (pp. 340-5); Some
cts of *Vinca* alkaloids on nucleic acid metabolism,
J. F. Richards and C. T. Beer (pp. 346-51); The origin
indole alkaloids, by W. I. Taylor (pp. 368-73);
e structures of the oncolytic alkaloids vinblastine
LB) and vincristine (VCR) from *Vinca rosea* (*Catha-*
thus roseus), by N. Neuss, M. Gorman and N. J.
ne (pp. 389-92); The chemistry of some monomeric
tharanthus alkaloids, by M. Gorman and N. Neuss
. 393-6); The use of high-resolution mass spectro-
try in the structure elucidation of *Catharanthus*,
ca and related alkaloids, by K. Biemann (pp. 397-
); Alkaloids from *Schizozygia caffaeoides*. III.
uctural relationships between schizozygine and some
ted alkaloids, by U. Renner [in German] (pp. 406-
; On alkaloids. XIV. Spectral studies of lochneri-
e and lochnerinine, by B. K. Moza and J. Trojánek
. 416-27); On the alkaloids from *Vinca minor*, by
Iokry and I. Kompis (pp. 428-34); The synthesis of
ca minor alkaloids, by M. E. Kuehne (pp. 435-9);
serpideine, by E. Smith and others (pp. 440-6) [see
H.A., 34: 7395]; Studies on *Catharanthus lanceus*.
Separation of leaf alkaloid fractions and the isola-
n of leurosine, perivine, yohimbine and vindoline, by
D. Loub and others (pp. 470-9); Idem. V. Prepara-
n of root alkaloid fractions and the isolation of
alicine, yohimbine, pericalline, perimivine and
ialanceine, by R. N. Blomster and others (pp. 480-5).

8. Richter, I., and others.
Über Alkaloidbildung in Gewebekulturen von *Catharanthus roseus* G. Don. (**Alkaloid formation in tissue cultures of *Catharanthus roseus*.**) *Naturwissenschaften*, 1965, **52**: 305-6, bibl. 5.

method of callus tissue culture is described [see
H.A., 33: 1362 and 4246]. Alkaloids (vindoline and
lolinine) were synthesized chiefly in the leaf and stem
us tissue, and only in trace quantities in the root
us tissue.—Dtsch. Akad. Wissensch., Halle/Saale.

9. Mothes, K., and others.
Physiologische Bedingungen der Alkaloid-Synthese bei *Catharanthus roseus* G. Don. (**Physiological conditions of alkaloid synthesis in *Catharanthus roseus*.**) *Naturwissenschaften*, 1965, **52**: 431, bibl. 3.

rief account is given of changes in the content of
loids in root, shoot and leaves of young *Vinca rosea* plants as affected by growth stage and exposure to light or darkness.—Inst. Biochem. Pfl., Halle-Saale.

8550. Moza, B. K., and Trojánek, J.
Catharosine, a new alkaloid from *Catharanthus roseus* G. Don. *Chem. Ind., Lond.*, 1965, No. 28, p. 1260, bibl. 14.

Isolation and properties.

8551. Trojánek, J., Koblicová, Z., and Bláha, K.
Absolute configuration of vincamine and some other alkaloids of the eburnamonine type. *Chem. Ind., Lond.*, 1965, No. 28, p. 1261, bibl. 15.

Isolated from *Vinca* spp.

8552. Farnsworth, N. R., and Hilinski, I. M.
Studies on *Catharanthus* alkaloids. III. Separation of vincaleukoblastine, leurocristine, leurosine and leurosidine by thin-layer chromatography. *J. Chromatog.*, 1965, **18**: 184-8, bibl. 39, illus.

Catharanthus roseus (= *Vinca rosea*).

Dye plants.

8553. Campos Neves, M. T., and Campos Neves, A.
Algumas determinações nas folhas do *Phyllanthus reticulatus* Poir, de Moçambique. (**Some determinations on the leaves of *Phyllanthus reticulatus* from Mozambique.**) [French and English summaries 12 lines each.] *Garcia de Orta*, 1963, **11**: 257-64, bibl. 10, illus.

Morphology, anatomy and composition, including flavonoids, tannins and four organic acids, namely elagic, m-digallic, pyrogallic and m-coumaric.

8554. Raszeja, W.
Studies on the rhizome of *Rubia tinctorum* L. I. Quantitative determination of anthra-derivatives. [Polish.] *Biul. Inst. Rośl. leczn.*, 1964, **10**(1): 6-14, from *Analyt. Abstr.*, 1965, **12**, Abstr. 3485.

Outline of the method.

Essential oils.

(*See also* 8323, 8324.)

8555. Baquar, S. R., and Reese, G.
Cytotaxonomische und gaschromatographische Untersuchungen an norddeutschen Mentha-Formen. 1. Teil. (**Cytotaxonomic and gas-chromatographic investigations of North German *Mentha* species. Part 1.**) *Pharmazie*, 1965, **20**: 159-68, illus.

Studies on chromosome numbers, anther structure, meiosis and pollen characteristics are reported in detail for *Mentha pulegium*, *M. arvensis*, *M. aquatica*, *M. spicata*, *M. longifolia*, and the 5 hybrids *M. verticillata*, *M. gentilis*, *M. piperita*, *M. dumetorum* and *M. niliaca*. The inter-relationships of these 10 species and hybrids are discussed.—Univ. Kiel.

8556. Baquar, S. R., and Reese, G.
Cytotaxonomische und gaschromatographische Untersuchungen an norddeutschen Mentha-Formen. 2. Teil. Gaschromatographische Untersuchungen. (**Cytotaxonomic and gas-chromatographic investigations of North German *Mentha* species. Part 2. Gas-chromatographic investigations.**) *Pharmazie*, 1965, **20**: 214-19, bibl. 8, illus.

The percentage composition was determined of volatile oils in individual plants of various *Mentha* spp. and hybrids. The results showed a fairly wide range of variation, depending on environment, stage of development and method of extraction, but there were indications of a genetic basis for oil content, and an approximation to specific classification could be gleaned from a comparison of chromatographic peaks. This is illustrated by *M. dumetorum*, a hybrid of *M. longifolia* and *M. aquatica*, whose peaks were present in one or other of the parents, though sometimes absent in all other investigated species. *M. piperita*, on the other hand, a hybrid of *M. aquatica* and *M. spicata*, had peaks lacking in both parents. Further investigations are necessary before deciding if oil composition really represents a taxonomic feature. Chromosome numbers for north German species and hybrids are given.

8557. DUTTA, P. K., AND OTHERS.
Effect of soil types on yield of *Mentha arvensis* Linn. *Indian J. Agron.*, 1964, **9**: 286-7, bibl. 6.

In a pot trial in which 6 different types of soil were used, the heavier soils appeared to favour the yield of green herb although yield differences were not significant.—Reg. Res. Labs, Jammu and Jorhat.

8558. ANON.
Queda de fôlhas da menta pode ter muitos motivos. **(Mint leaf-drop may have many causes.)** *Dirig. Rur.*, 1964, 3(6): 27-8, illus., from *Trop. Abstr.*, 1965, **20**, Abstr. n 1039.

This disorder of *Mentha arvensis* in Brazil may be due to leaf rust (*Puccinia menthae*, which can be controlled with maneb, bordeaux or wettable suphur), *Sclerotium* root disease (which can be avoided by the use of resistant varieties), insect attack, water-logging or too close spacing. Sulphur and strong-smelling insecticides should not be applied within 20 days of harvesting.

8559. HORNER, C. E.
Control of mint rust by propane gas flaming and contact herbicide. *Plant Dis. Reptr*, 1965, **49**: 393-5, bibl. 9.

Excellent control of mint rust (*Puccinia menthae*) was obtained by applying propane flame (2–3 m.p.h. at 40 p.s.i.) or the contact herbicide DNBP (alkanolamine salts of 4,6-dinitro-*o*-*sec*-butylphenol at 2–6 lb./acre) to the soil surface at the time of shoot emergence. Flaming caused less damage than the herbicide and was slightly more effective. [From author's abstract.] [See also *H.A.*, 34: 1346.]—Ore. St. Univ., Corvallis.

8560. FAULKNER, L. R., AND SKOTLAND, C. B.
Interactions of *Verticillium dahliae* and *Pratylenchus minyus* in *Verticillium* wilt of peppermint. *Phytopathology*, 1965, **55**: 583-6, bibl. 17.

Freshly rooted peppermint tip cuttings (*Mentha piperita*) were inoculated with microsclerotia of *Verticillium dahliae* f. *menthae* alone and/or with varying numbers of *Pratylenchus minyus* in the greenhouse. The presence of the nematode increased both the incidence and the severity of *Verticillium* wilt symptoms and reduced the incubation period for *Verticillium* wilt. The rate of reproduction for *P. minyus* was greater in plants infected with both pathogens than in plants infected by the nematode alone. Dry weights of infected plants were reduced by as much as 22% when the inoculum contained either pathogen alone. However, when the inoculum contained combinations of *V. dahliae* and *P. minyus* the dry weights of infected plants were reduced by as much as 68% in comparison with the controls. [Authors' abstract.]—Wash. St. Univ., Prosser.

8561. HORNER, C. E., AND DOOLEY, H. L.
Propane flaming kills *Verticillium dahliae* peppermint stubble. *Plant Dis. Reptr*, 1965, 581-2, bibl. 5, illus.

Flaming of peppermint stubble at 1 m.p.h. an p.s.i. gas pressure nearly eliminated *Verticillium dah* from infected stems. A flamer speed of 2 m.p.h 35 p.s.i. gave 80 and 89% kill in wet and dry ste respectively. Speeds above 2 m.p.h. were much effective. [From authors' abstract.]—Ore. St. U Corvallis.

8562. STAHL, E., AND SCHEU, D.
Artemisiaketon als Hauptbestandteil des äthe chen Öles einer neuen Rainfarn-Rasse. **(Arte sia ketone as the chief constituent of the essen oil of a new strain of tansy.)** *Naturwissenschaf* 1965, **52**: 394, bibl. 3.

Up to 90% of the essential oil of a newly encounte strain of tansy (*Tanacetum vulgare*) consists of artem ketone which has hitherto been found only in *Arten* *annua*, a native of eastern Asia.

8563. CHLÁDEK, M., AND SPURNÁ, V.
Příspěvek k jakosti drogy kříženců rodu *Thy* **(A contribution to the quality of medicinal material in crosses of the genus *Thymus*.)** [Engl Russian, and German summaries ½ p. ea *Věd. Práce výzk. Úst. zelin. v Olomouci*, 196 213-22, bibl. 64, illus.

The essential oil contents of the wild thymes, *Th* *marschallianus* var. *eu-marschallianus* and *T. marsc* *lianus* subf. *pseudo-citriodorus*, were 1·79% and 1· 1·92%, respectively. New hybrids originating f natural cross pollination of the common thyme *vulgaris*, with some wild thymes showed essential contents of up to 2·68%. Out of these a selected c with a typical lemon aroma and a 1·75% essential content will be tested for productivity. The conten phenolic substances in the essential oil of thyme and hybrids ranged from 45 to 69%.

Fibres.

(*See also* 7848.)

8564. ARINŠTEJN, A. I., AND MIGAL', N. D.
The influence of the number of pollen grains hemp on their germination, the growth of pollen tubes and yield of hybrid seeds. [Russia *Agrobiologija*, 1965, No. 1, pp. 151-3.

In laboratory trials on 3 varieties the percent germination of pollen and pollen tube growth on a ficial media both increased with increasing numbers pollen grains. Seed yields and quality in the field a rose with increasing numbers of pollen grains app to the stigma.

8565. MARGARA, J.
Variation de l'activité gibbérellinique endog consécutive à la diminution de la photopéri chez *Cannabis sativa* L. **(Variation of endogen gibberellic activity following photoperiod reduct in *Cannabis sativa*.)** [English summary 4 lin *Ann. Physiol. vég.*, 1965, 7: 41-6, bibl. 18.

A statistically significant reduction in gibberellic acti was observed in seedlings of the variety Fibrimon after 3 short photoperiods of 8 hours compared wit control of 18 hours. Tests were carried out 17 d after sowing. After floral initiation, however, c flicting results were obtained; short photoperiods appreciable effect on the activity of plants aged 28 33 days, but resulted in activity significantly greater n that of the control in plants aged 55 and 78 days. ent. nat. Rech. agron., Versailles.

6. Jakobey, I.
Kísérletek finomrostú kender elöállítására. **(Experiments on producing hemp with fine fibres.)** [English and Russian summaries ½ p. each.] *Növénytermelés*, 1965, **14**: 45-54, bibl. 8.

ven spacings and 7 harvesting dates were tested. h increased spacing the fibre percentage, and w and fibre yields per unit area declined. Highest w and fibre yields were obtained at a spacing of 35 sq. cm. per plant, and the finest fibre at 25 sq. cm. plant. The fibre content of male plants was always ner than that of female. Hemp harvested a month ore technical maturity produced only 53–72% of w and 52–62% of fibre compared with hemp cut at nical maturity (early August). The fibre of the y harvested hemp was, however, much finer and its ile strength was 25 km., which is adequate. Straw fibre yields were lower and fibre quality higher in e than in female plants.

7. Lerche, K.
Sisal in South Africa. *Fmg S. Afr.*, 1965, **40**(12): 20-5, 32, and **41**(1): 49-54, illus.

first part deals with habitat, planting material and ivation, and the second part with yields, diseases, ring for replanting and extraction.

3. Hopkinson, D.
Soil-applied herbicides in sisal. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 6.

od weed control for up to 20 weeks was provided in oil nurseries by diuron at 4·8 kg., atraton at 3·5 kg. simazine at 4 kg./ha., provided there was not less n 25 mm. rain within a few days after treatment. oted bulbils were especially liable to transient rosis following the application of diuron. Cotoran 3-trifluoromethylphenyl)-*N′*, *N′*-dimethylurea] at kg./ha. was effective for 12 weeks and was both less endent than diuron on rainfall and less toxic to sisal. ung, actively growing sisal was very sensitive to nacil (2·4–3·6 kg./ha.) but chlorotic symptoms on er plants did not affect growth. Bromacil has the antage that it does not have to be applied to clean-ded ground. Its sensitivity to competition from ds, proneness to injury by hand-weeding and erent tolerance make sisal a good crop in which to herbicides. If planting could be completed before onset of the main rains and the date of planting oils be brought forward to the same period, the good spect of timely rainfall thus afforded would make use of soil-acting chemicals economic even at ent prices.—Sisal Res. Stat., Ngomeni, Tanzania.—m *Weed Abstr.*, **14**, No. 111.

). Twiga Chemical Industries Ltd.
Soil-acting herbicides in sisal. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 2.

ls have shown that Karmex (diuron 80%) at 4 lb./ may safely be used after planting sisal bulbils. atment should be applied in 80–100 gal. water to ice mottling of the crop. Up to 8 lb./acre may be ied in 40–50 gal. spray before planting, but this is favoured owing to the need for subsequent disturbance of the soil. In field sisal, rates of 4–6 lb./acre after planting give control for 6 months. Hyvar X (bromacil) at more than 2 lb./acre controlled broad-leaved weeds and rates of more than 4 lb./acre controlled grasses for up to 6 months. As with Karmex, the use of high-volume sprays minimizes mottling.—From *Weed Abstr.*, **14**, No. 112.

8570. Pinkerton, A.
Parallel streak in sisal. Part V. *Kenya Sisal Bd Bull.*, 1965, No. 52, pp. 27, 29, 31, illus.

An experiment is described in which whole sisal plants and leaves and roots separately were subjected to different temperature regimes. The results showed that temperature was the critical factor in the appearance of parallel streak symptoms. A negative correlation was found between the minimum night temperature and the percentage of leaves showing symptoms, and the critical level was established as 61° F., above which no symptoms occurred. [For part IV see *H.A.*, 34: 7424.]

8571. Anon.
The production of hecogenin. *Kenya Sisal Bd Bull.*, 1965, No. 52, pp. 37, 39, illus.

Brief details are given of the process used in Kenya for the extraction of hecogenin from sisal leaves.

Gums and resins.

8572. Tookey, H. L., and Jones, Q.
New sources of water-soluble seed gums. *Econ. Bot.*, 1965, **19**: 165-74, bibl. 10.

Seeds from 300 species representing 139 genera in 31 families have been surveyed for water-soluble gum (mucilage). Four families, Leguminosae, Plantaginaceae, Cruciferae and Convolvulaceae, have species the seeds of which contain more than 18% gum. Of 163 legume species in 45 genera, 36 contained more than 18% gum, and 54 contained 10 to 18%. Gums from 20 legumes have been analysed for component sugars; these are all galactomannans. Their specific optical rotation increases regularly as the mannose content decreases. In the legume seed, gum often comprises most of the endosperm. These galactomannan gums can be separated by a milling process to provide commercial-grade gums useful for paper additives and for sizing, thickening or stabilizing agents. [Authors' summary.]—U.S. Dep. Agric., Peoria, Ill., and Beltsville, Md.

8573. Atwal, A. S., and Sidhu, G. S.
Legumes in the nitrogen economy of soil. I. Fixation and excretion of nitrogen by Indian legumes under controlled conditions in sand culture. *Indian J. agric. Sci.*, 1964, **34**: 139-45, bibl. 14.

Guar (*Cyamopsis tetragonoloba*) was grown in sand supplied with various nutrient solutions. The N contents of tops, roots, nodules, seed, sand substrate and cold-water leachate were estimated. Plants which received N-deficient solution failed to establish well. Small doses of N improved nodulation, growth and N fixation. Solutions deficient in molybdenum lowered N fixation, nodulation and yield. Solutions deficient in all micronutrients also lowered yields. There was a direct relationship between the weight of nodules, their leghaemoglobin content and the quality of N fixed by them. The cold-water leachate of the sand contained very little N.—Punjab agric. Univ., Ludhiana.

8574. Orellana, R. G., Thomas, C. A., and Kinman, M. L.
A bacterial blight of guar in the United States. *FAO Plant Prot. Bull.*, 1965, **13**: 9-13, bibl. 6, illus.

Cyamopsis tetragonoloba suffers from a leaf and stem blight due to *Xanthomonas cyamopsidis.* Control is best accomplished by the use of resistant varieties of which Brooks is commercially available in the U.S.A. The use of disease-free seed is recommended where disease-resistant varieties are unobtainable.—U.S. Dep. Agric., Beltsville, Md.

8575. Sowell, G., Jr.
Alternaria **leafspot of guar.** *Plant Dis. Reptr*, 1965, **49**: 605-7, bibl. 9, illus.

Leaf spot of guar (*Cyamopsis tetragonoloba*) caused by *Alternaria cucumerina* can be distinguished from anthracnose by the presence of concentric rings in the larger spots. The fungus is seed-borne on guar.—U.S. Dep. Agric., Experiment, Ga.

8576. Sowell, G., Jr.
Anthracnose of guar. *Plant Dis. Reptr*, 1965, **49**: 607-9, bibl. 8, illus.

Causal organism identified as *Colletotrichum dematium* f. *truncata*, and 3 methods of testing for its presence in seed samples compared.

8577. Oda, Y.
Studies on a new polysaccharide obtained from the latex of the Japanese lacquer tree. [Japanese, with English summary 1½ pp.] *Bull. Univ. Osaka Pref. Ser. B*, 1965, **17**: 59-82, bibl. 77, illus.

The chemical structure of the polysaccharide was found to comprise 6-0-D-galacturonosyl D-galactose. A steric configuration is proposed.

Hops.

(*See also* 6877.)

8578. Van de Woestijne, N., and Sacreas, H.
Quelques données concernant les frais de création d'une houblonnière de 1 ha. **(Information on the costs of establishing a hop garden of 1 ha.)** *Rev. Agric., Brux.*, 1965, **18**: 425-7.

The costs of mechanical equipment, salaries, poles, string, plants and fertilizers are expressed as percentages. Harvesting and drying are not taken into account. The estimated total is 167,450 F.

8579. Beníček, J.
Zkušenosti s mechanizovanou výsadbou chmele. **(Experiments on the mechanized planting of hops.)** *Chmelařství*, 1965, **38**: 40-2, illus.

Standard hop sets planted by a tractor-drawn semi-automatic planter at a rate of 2 ha. per 8 hours had a high rate of survival. Machine planting in the autumn was preferred, but planting in the spring, not later than the end of April, also gave good results.

8580. Kříž, J.
Chemický boj proti plevelům ve chmelnicích. **(Chemical weed control in hop gardens.)** *Chmelařství*, 1965, **38**: 83-6, illus.

In preliminary glasshouse tests 19 herbicides, each at rates, were evaluated. In replicated field trials in productive mature hop garden simazine, atrazine a prometryne were applied at the end of April, shor after weed emergence and the start of hop grow Eight weeks after treatment simazine at 4 to 15 kg./ gave 93 to 97·7% weed control, atrazine at 2 to 10 k ha. gave 97 to 100% and prometryne at 2 to 10 kg./ gave 97 to 99·5% control. Weed regrowth after cu vation was more rapid on plots treated with prometry than on those treated with simazine or atrazine. In case were the hops injured or cone quality affect The destruction of wild hops and in particular of m plants is compulsory in Czechoslovakia, and for t purpose 2,4,5-T preparations were found suitable.

8581. Škoda, V.
Vliv zvýšeného fosforečného hnojení na výnos kvalitu chmele. **(The effect of increased rates phosphorus fertilizers on hop yield and qualit** *Chmelařství*, 1965, **38**: 90-2, and 110-11.

In 3 years' trials in 3 different hop gardens fertili applications were (1) no fertilizer, (2) NK, (3) NK 65 kg./ha. P_2O_5, (4) NK+85 kg. P_2O_5 and (5) NK 105 kg. P_2O_5. Average yields increased in ascendi order from 1 to 5. Commercial evaluation and assessment of brewing value by Wöllmer's meth showed only small differences between the treatmen Increasing the P rate was very economical and as optimum rate a 1 or 1·1 : 1 N : P ratio is recommend

8582. Doubravský, J.
Zelené hnojení v širokých sponech kryje potře hnojiv a zvyšuju výnosy. **(Green manuring widely spaced crops covers the manurial requi ment and increases yields.)** *Chmelařství*, 19 **38**: 106-8.

In 3 years' trials in 3 localities green manure crops w used to substitute for FYM in the following treatmen NPK+*Phacelia tanacetifolia* and NPK+*Pisum sativ* var. *arvensis*, compared with NPK alone. Field pe and *Phacelia* increased dry hop yields by 213 and 2 kg./ha., respectively, and slightly improved quality.

8583. Klapal, M., and Klapal, I.
Význam síry ve výživě chmele. **(The importan of sulphur in hop nutrition.)** *Chmelařství*, 19 **38**: 90.

One half of a hop garden received chloride fertiliz for 3 years and produced consistently lower yields, a in the 3rd year less vigorous growth, some chlorosis a premature leaf fall, compared with the other half whi received sulphate fertilizers. In the 4th year sulpha were applied to the whole garden; yields were n measured but there were no visual differences betwe the halves.

8584. Christie, T.
The effects of some phenolic compounds upon growth of two species of *Phytophthora*. *N.Z. agric. Res.*, 1965, **8**: 630-5, bibl. 8.

A strain of *Phytophthora cactorum* causes a serio disease of hops in the Nelson district. Only the Ca fornian variety shows no resistance to the fungus; Fugg is resistant. The effects of 26 phenolic compounds the growth of *P. cactorum* and *P. parasitica* we determined. Cinnamic acid inhibited growth m than any other compound.—Cawthron Inst., Nels

85. PETRLÍK, Z.
Ověřování kvality postřiků chmele mědnatými přípravky otiskovou metodou. **(An evaluation of hop spraying with copper preparations using the imprint method.)** [Russian and German summaries ⅛ p. each.] *Chmelařství*, 1965, **38**: 105-6, illus.

modified imprint method was used in these studies,
ised on the reaction of potassium ferrocyanide plus
etic acid solution with the copper oxide or copper
ychloride used in downy mildew control. Leaves
id cones treated with copper fungicides which were
essed on cyclostyle paper wetted with the solution
t a clear reddish-brown imprint. These imprints
ere graded according to the area covered by the spray,
id an index, based on the percentages of samples in
e different grades, is proposed.

86. PETRLÍK, Z.
Ochrana chmele v širokých sponech rosičem S 051. **(The protection of hops in wide stands with the S 051 sprayer.)** *Chmelařství*, 1965, **38**: 42-4, 70-2, illus.

ie performance of this large air-blast sprayer was
sted in the field and laboratory. Very good coverage
is obtained in 260 cm.-wide rows during the first 2
eatments, mainly against mildew, when the machine
ivelled through alternate inter-rows. After the hops
ached the top of the wirework, however, the machine
d to traverse each inter-row to obtain adequate
verage.

87. HORNER, C. E.
Verticillium wilt of hops in Oregon. *Plant Dis. Reptr*, 1965, **49**: 538-40, bibl. 19.

ie disease was first recorded in Oregon in 1956. Out-
eaks prior to 1962 were caused by *Verticillium dahliae*,
d in 1962 *V. albo-atrum* was also recorded. Neither
ecies caused the progressive form of wilt, and the
read is apparently slow.—Ore. St. Univ., Corvallis.

88. ŠÁLY, A., AND KŘÍŽ, J.
Príspevok k výskytu hád'atka chmel'ového (*Heterodera humuli* Filipjev) v ČSSR. **(A contribution on the occurrence of hop nematode, *Heterodera humuli*, in Czechoslovakia.)** [English and Russian summaries ½ p. each.] *Pol'nohospodárstvo*, 1965, **11**: 18-25, bibl. 48.

inkle disease of hops and the biology and distribution
the hop nematode are reviewed. It is suggested that
e hop nematode plays a part in causing crinkle disease
t this has not yet been confirmed. In pot and field
periments soil applications of 1,2-dibromo-3-chloro-
opane retarded nematode development, removed
sease symptoms and approximately doubled cone
elds.

89. KŘÍŽ, J.
Dlouhodobá prognóza mšice chmelové. **(Long-term forecasting of the hop aphid.)** *Chmelařsívt*, 1965, **38**: 61-2.

method of forecasting outbreaks of *Phorodon humuli*
hops, developed by Blattný, is based on examining
im, damson or blackthorn shoots in the winter and
viding the number of buds by the number of aphid
gs found on these winter hosts. Comparisons be-
een predictions and actual incidence over the past 15
ars have shown that values up to 10 have reliably
recast very severe outbreaks, and values above 100
ry mild outbreaks.

8590. HAUTKE, P., AND PETŘÍČEK, D.
Vliv opylení na stavbu chmelové hlávky a pivovarsky účinné složky. **(The effect of pollination on the structure of hop cones and on their effective components in regard to brewing value.)** [Russian and German summaries 9 lines each.] *Rostlinná Výroba*, 1965, **11**: 281-6, bibl. 6.
HAUTKE, P.
Vliv opylení chmele na jakost hlávek. **(The effect of pollination on cone quality in hops.)** *Chmelařství*, 1965, **38**: 102-3.

In controlled pollination trials seed set was induced, and samples containing different numbers of seeds were analysed. Increasing the number of seeds raised the proportion of bracts plus seeds, substances from which, extracted during brewing, have an unfavourable effect on beer quality. No significant relationship was found between the number of seeds and the content of components affecting the brewing value as determined by Wöllmer's method.

8591. VERZELE, M., ANTEUNIS, M., AND ALDERWEIRELDT, F.
Isohumulones. *J. Inst. Brew.*, 1965, **71**: 232-9, bibl. 16.

Isomerization of humulone produces a mixture of 2 pairs of stereoisomers. *Iso*humulone A (melting point 62° C.) and *iso*humulone B (an oil) are formed in the largest amounts. The second pair is present in smaller quantities (e.g. 4·5–8%) and comprises allo*iso*humulones A and B. [From authors' abstract.]

8592. BUTTERY, R. G., BLACK, D. R., AND KEALY, M. P.
Volatile oxygenated constituents of hops. Identification by combined gas chromatography and mass spectrometry. *J. Chromatog.*, 1965, **18**: 399-402, bibl. 8.

The majority of 87 compounds, isolated from a hop oil obtained by steam distillation of Brewers Gold hops, identified or classified. [See also *H.A.*, 35: 4279.]

Insecticidal plants.

8593. COLLINGS-WELLS, L. J.
Weed control with soil-acting herbicides in pyrethrum. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 3.

A number of herbicides were examined during 1961-3 for their selectivity to pyrethrum in free-draining, red volcanic loam soil. OMU at 4 lb. and chloramben at 6 lb./acre selectively controlled weeds for 11 weeks, but would be uneconomic at current prices. Neburon at 4 lb. and fenac at 1 lb./acre gave control for 13–14 weeks, but slightly injured 3-year-old pyrethrum. Trietazine at 1·5 lb./acre also showed promise. Simeton at 3 lb., simazine at 1·5 lb. and diuron, fenuron and monuron at 4 lb./acre each gave control for 9½–16 weeks, but crop injury was in some cases severe. Pyrethrum seedlings tolerated simazine at 0·5 lb./acre. Although OMU at 4·8 lb./acre killed 7% of newly planted splits, it was more selective than neburon, simazine at 1 lb., diuron at 0·9 lb. or dichlobenil at 7·2 lb./acre. Liquid chloramben at 3·75 lb./acre did not appreciably affect the germination of seed sown 11 days after treatment and the beds remained fairly clean up to 8 weeks from sowing. [See also *H.A.*, 33: 7897 and 35: 6416.]—Pyreth. Stat., Molo, Kenya.—*Weed Abstr.*, **14**, No. 55.

Rubber plants.

8594. Pant, R., and Srivastava, S. C.
The proteins of some plant latex. *Curr. Sci.*, 1965, **34**: 212-14, bibl. 12.

Latex sera from 12 plants were subjected to electrophoretic analyses. The plants, with the number of proteins found in each, were: *Ficus carica* (3), *F. religiosa* (2), *F. glomerata* (2), *F. bengalensis* (1), *Calotropis gigantea* (2), *C. procera* (2), *Euphorbia nerifolia* (3), *E. tirucalli* (1), *Ervatamia coronaria* (2), *Wrightia tinctoria* (2), *Carica papaya* (3) and *Artocarpus integrifolia* (4). [See also *H.A.*, 34: 5485.]—Univ. Allahabad.

Seed oils.

(*See also* 7662, 8381.)

8595. Commonwealth Economic Committee.
Vegetable oils and oilseeds. [*Publ.*] *Commonw, econ. Cttee*, 1965, pp. 251, H.M.S.O., London. 10s.

A review of production, trade, utilization and prices relating to oil-bearing crops, including olive, coconut, oil palm, castor, tung and minor sources.

8596. Shitole, A. D., and others.
Some minor oilseeds of Mysore State. *Indian Oilseeds J.*, 1965, **9**: 14-19, bibl. 11.

Analytical data and brief descriptions are presented relating to samples of 13 minor oilseeds collected during 3 seasons. Where possible the results are compared with those reported in published work. The seeds studied were those of *Actinodaphne hookeri*, *Bassia latifolia*, *Calophyllum tomentosum*, *C. wightianum*, *Celastrus paniculata*, *Garcinia cambogia*, *G. indica*, *G. morella*, *Hydnocarpus wightiana*, *Pongamia glabra*, *Schleichera trijuga*, *Terminalia belerica* and *Vateria indica*.

8597. Banzuelo, R. N.
The effects of treatments with gibberellic acid on castor bean plants (*Ricinus communis* Linn.). *Araneta J. Agric.*, 1964, **11**: 208-58, bibl. 47, illus.

In laboratory germination tests seeds were soaked for 24 hours in solutions of GA at 0, 15, 30, 45 or 60 p.p.m. but differences in germination rate were insignificant. In a field test seeds were either left unsoaked or soaked in distilled water and in GA at 45, 90 or 135 p.p.m. A significant difference was observed between the germination percentages of soaked seed and that of an unsoaked control but no significant differences existed between the treatments. In studies of plants raised from seed which had been soaked in either distilled water (control) or GA in concentrations of up to 60 p.p.m. it was found that plants of the 60 p.p.m. GA treatment flowered and matured earlier than the control and that plants of the 45 p.p.m. GA treatment had the greatest height and stem diameter on harvesting at 7 months. The greatest number of nodes and raceme-bearing branches were found on plants of the 15 p.p.m. and 60 p.p.m. treatments, but the differences were not statistically significant. Differences in yields of unshelled beans were also insignificant although the 60 p.p.m. GA treatment resulted in the greatest yield.

8598. Morris, R. S., Spies, J. R., and Coulson, E
**The chemistry of allergens. XVII. Disc elec
phoresis and gel diffusion of the carbohydrate-
allergenic protein, CB-65A, from castor be**
Arch. Biochem. Biophys., 1965, **110**: 300-2,
11, illus.

8599. Anon.
Broadening horizons for crambe oil. *Agric. F
Wash.*, 1965, **13**(11): 6.

Notes on potential industrial uses.

8600. Kleiman, R., and others.
**Search for new industrial oils. XII. Fifty-e
Euphorbiaceae oils, including one rich in vern
acid.** *J. Amer. Oil Chem. Soc.*, 1965, **42**: 169
from abstr. in *J. Sci. Food Agric.*, 1965, **16**: ii-

The seed oils from 58 species of the Euphorbiac
were analysed for their oil and protein conte
together with their component fatty acids. The
had I values of 87 to 221, and some contained
linolenic acid, 77% linoleic acid or 84% of oleic a
The oil obtained from *E. lagascae* contained 57%
vernolic acid, and from the amount of triverno
present random or restricted random distribution
this acid is indicated.

8601. Knowles, P. F., and Miller, M. D.
Safflower. *Circ. Calif. agric. Exp. Stat.
Serv.* **532**, 1965, pp. 51, illus.

Biology, varieties, growth requirements, cultural pr
tices, irrigation, weed control, pests and disea
harvesting and products.

8602. Ashri, A., and Efron, Y.
**Inheritance studies with fertile interspecific hyb
of three *Carthamus* L. species.** *Crop Sci.*, 1
4: 510-14, bibl. 13, illus.

The inheritance mechanisms of 10 characters w
studied in interspecific crosses between *C. palaesti*
C. oxyacantha and two *C. tinctorius* varieties, Austra
Spineless and Pacific 7. It is suggested that th
species form 1 complex, containing wild and cultiva
races. It appears likely that *C. palaestinus*, or a sim
species, has been the progenitor of cultivated safflow
[From authors' summary.]—Hebrew Univ., Reho
Israel.

8603. Karvé, A. D., and Salanki, A. S.
**A new phase shift pattern and its use in interpre
some photoperiodic phenomena.** *Naturwis
schaften*, 1965, **52**: 215, bibl. 5.

An experiment was conducted upon partially etiolat
4-day-old *Carthamus tinctorius* seedlings, which prod
error actuated feed-back oscillations if kept in
horizontal position for 30 minutes and then brou
back to their normal position. The disturbing stimu
in this case consisted of keeping the oscillating seedli
in an inverted condition for 15 minutes at various tim

8604. Klisiewicz, J. M.
**Identity of viruses from safflower affected w
necrosis.** *Plant Dis. Reptr*, 1965, **49**: 541-5, b
17, illus.

Lettuce mosaic virus and alfalfa mosaic virus w
isolated from safflower plants affected with sev
necrosis. The safflower LMV isolate was similar
characteristics to an LMV isolate from lettuce. L
was identified as the cause of necrosis in safflower vari
Pacific 7, but a strain of AMV was not associated w

rosis in safflower and caused no apparent damage to culated plants. [From author's summary.]—Univ. lif., Davis.

5. BARASH, I., KLISIEWICZ, J. M., AND KOSUGE, T.
Biochemical factors affecting pathogenicity of *Botrytis cinerea* on safflower. *Phytopathology*, 1964, **54**: 923-7, bibl. 17.

chates from safflower blossoms contained nutrients t stimulated the germination of conidia of *B. cinerea*, pectic substances that induced the production of ygalacturonase in germinating conidia of this fungus. culated flower heads contained less fructose and ose than uninoculated flower heads, and free cturonic acid was detected in their extracts. [From hors' abstract.]—U.S. Dep. Agric., and Univ. Calif., vis.

6. ZIMMER, D. E., AND LEININGER, L. N.
Sources of rust resistance in safflower. *Plant Dis. Reptr*, 1965, **49**: 440-2, bibl. 8.

some 1,200 introductions and selections evaluated ler field conditions 18 were selected as resistant to rust *ccinia carthami*). [See also *H.A.*, 33: 3730, 7914, 6442.]—Utah agric. Exp. Stat., Logan.

7. ZIMMER, D. E.
Efficacy of some anti-fungal substances for control of seedling safflower rust. *Plant Dis. Reptr*, 1965, **49**: 623-6, bibl. 4.

loheximide, cycloheximide oxime, cycloheximide icarbazone, N-3412 (dichlorotetrafluoroacetone rate), phleomycin, and Phytoactin L-318 were luated both as seed protectants for the control of l-borne safflower rust (*Puccinia carthami*) and as tectants against and eradicants of seedling infection n applied as pre-inoculation or post-inoculation ar sprays. Seed-borne rust spores were completely trolled by 50 and 100 p.p.m. solutions of cyclohexie and its oxime and semi-carbazone derivatives. iar application, either 48 or 96 hours before or after culation, showed that all the substances had some tective or eradicative value at less than highly totoxic concentrations; these values increased as the rval between application and inoculation, or from culation and application, decreased from 96 to 48 rs. No treatment provided complete control. thor's abstract.]—U.S. Dep. Agric., Logan, Utah.

3. DAVID, B. A., AND DAVID, M. H.
First record of the safflower fly, *Acanthiophilus helianthi* Rossi (Tephritidae: Diptera) from Uttar Pradesh, India. *Allahabad Fmr*, 1964, **38**(2): 49-51, bibl. 7, from *Trop. Abstr.*, 1965, **20**, Abstr. n1051.

The fly is partly controlled by insect predators but farmers are advised to destroy infested buds and to grow resistant varieties.

Sugar maples.

8609. JACOBS, R. D.
Seasonal height growth patterns of sugar maple, yellow birch, and red maple seedlings in Upper Michigan. *Res. Note Lake St. Forest Exp. Stat., Minnesota*, **LS-57**, 1965, pp. 4, bibl. 6.

Tannin plants.

8610. MORTON, J. F.
Can the red mangrove provide food, feed and fertilizer? *Econ. Bot.*, 1965, **19**: 113-23, bibl. 83, illus.

Uses of *Rhizophora mangle* (*R. racemosa*).

8611. CORNTHWAITE, D., AND HASLAM, E.
Gallotannins. Part IX. The biosynthesis of gallic acid in *Rhus typhina*. *J. chem. Soc. Lond.*, 1965, pp. 3008-11, bibl. 15.

Labelled sodium pyruvate fed to leaf discs of sumac (*R. typhina*) resulted in radioactive carboxyl groups in 60% of the gallic acid and 80% of the shikimic acid produced.

Sundry plants.

8612. BIGNARDI, A.
Il cardo lanario. Antica pianta industriale. **(The fuller's teasel. A former industrial plant.)** *Ital. agric.*, 1965, **102**: 469-79, bibl. 23, illus.

History of cultivation and use.

8613. RUPPEL, E. G., BARNES, D. K., AND SANTIAGO, A.
Potential of three *Rhizoctonia* species to incite foliar blight and damping-off on *Tephrosia vogelii* in Puerto Rico. *Phytopathology*, 1965, **55**: 612-14, bibl. 5, illus.

Isolates L-1 and L-2 (stem and leaf isolates, respectively, of *R. solani*) were most severe and frequently killed seedlings, whereas LO-2 (stem isolate of *R. dimorpha*) and IS-1 (foliar isolate of *R. bataticola*) induced only a few leaflet lesions and slight defoliation. Isolates L-1 and L-2 incited 100% pre-emergence damping-off in all trials. Isolate LO-2 induced an average of only 14% pre-emergence damping-off; however, an additional 34% of the seedlings were lost because of post-emergence damping-off within 3 weeks after planting. No seedlings damped-off in soil infested with IS-1. This is the first report of *R. dimorpha* as a pathogen of *Tephrosia vogelii*. [From authors' abstract. See also *H.A.*, 35: 1739.]—U.S. Dep. Agric., Mayagüez, Puerto Rico.

SUB-TROPICAL FRUIT AND PLANTATION CROPS.

Avocadoes.

4. CHALKER, F. C.
Avocado growing on the north coast [of New South Wales]. *Agric. Gaz., N.S.W.*, 1965, **76**: 364-8, illus.

ice on land preparation, planting distances and thods, pruning, cultivation and fertilization.

8615. GUSTAFSON, C. D.
San Diego County avocado production costs. *Calif. Citrogr.*, 1965, **50**: 362.

Cultural, harvesting and overhead costs totalled $619.40 per acre consisting of 70 to 100 trees, 10–20 years old, producing 8,000 lb. The costs are briefly itemized.

8016. PLATT, R. G., AND FROLICH, E. F.
Propagation of avocados. *Circ. Calif. agric. Exp. Stat. Ext. Serv.* 531, 1965, pp. 19, illus.

Avocado propagation is discussed as follows: the seed and seedling; budding (including a description of the T-method); tip grafts (common splice and whip-and-tongue); topworking (bark and leaf or notch grafting) and cuttings. [For cuttings see also H.A., 35: 9003.]

8017. GINSBURG, O., AND AVIZOHAR-HERSHENZON, Z.
Observations on vesicular-arbuscular mycorrhiza associated with avocado roots in Israel. *Trans. Brit. mycol. Soc.*, 1965, 48: 321-4, bibl. 11, illus.

Believed to be the first report of such mycorrhiza on avocado roots.

8018. HATTON, T. T., JR., HARDING, P. L., AND REEDER, W. F.
Seasonal changes in Florida avocados. *Tech. Bull. U.S. Dep. Agric.* 1310, 1964, pp. 48, bibl. 26, illus.

Over 40 commercial varieties were studied during the period 1954-62, in particular the varieties Pollock, Waldin, Booth 8, Booth 1, Lula and Taylor. Fruit diameter, fruit weight, oil content, loss in weight during the softening period, number of days for fruit to soften, palatability, specific gravity, ratio of fruit portions, firmness, colour, internal cracking, soluble solids and mineral components are recorded. It was found that picking date, oil content and size (fruit weight) and chemical constituents gave a good index of maturity; other characteristics were variable. [See also H.A., 35: [illegible].]

8019. GEISSMAN, T. A., AND DITTMAR, H. F. K.
A proanthocyanidin from avocado seed. *Phytochemistry*, 1965, 4: 359-68, bibl. 3.

The analytical and synthetic data presented lead to the conclusion that this substance consists of 2 flavan-derived units joined by a C-C linkage. [From authors' abstract.]—Univ. Calif., Los Angeles.

Citrus—general.

(*See also* 7964.)

8020. SHIZUOKA CITRUS EXPERIMENT STATION, KOMAGOE, SHIMIZU, JAPAN.
Report of the Shizuoka Citrus Experiment Station 1963, pp. 208. [Japanese.]

With a list of projects in English.

8021. HEADY, M. E.
The world citrus picture. *Punjab Fruit J.*, 1962-1964, 26/27: 6-24, bibl. 28.

World statistics of production, import and export of fruit and juices.

8022. [illegible], R.
Gli agrumi in Argentina. (**Citrus in Argentina.** English, French and Spanish summaries 1/2 p. each.) *Riv. Agric. subtrop.*, 1965, 59: 3-38, bibl. 25, illus.

Production, varieties (of orange, mandarin, lemon, grapefruit, [illegible]), harvesting and fruit processing.

8023. [illegible], F.
[illegible] (**The gardens of Benaco, what they were and what remains of them.**) [illegible], 1965, [illegible], bibl. 17, illus.

The history and decline of the remarkable [illegible] lemon groves on the western shore of Lake Garda, are described. [See also H.A., 33: 5762.]

8024. MEHTA, F.
The fruit industry in other lands. *Punjab Fruit J.*, 1962-1964, 26/27: 75-82, illus.

Californian citrus growing.

8025. SAID, M., AND DHARAMDAS, —
Sweet orange cultivation in Peshawar and [illegible] Ismail Khan Divisions. *Punjab Fruit J.*, 1962-1964, 26/27: [illegible]

Recommendations are made on fertilization, green manuring, budding in the nursery and cold storage, on the basis of experiments of which the results are presented.

8026. JAGIRDAR, S. A. P., AND [illegible], A. S.
What is wrong with citrus in Sind? *Punjab Fruit J.*, 1962-1964, 26/27: 50-[illegible], bibl. 4, illus.

Advice is given on environmental conditions, [illegible] and crop protection. The fruit characters of [illegible] varieties are described in words and there are photographs of 14 varieties.

8027. [illegible], S., AND [illegible], M. [illegible]
History and development of citrus [illegible] *Punjab Fruit J.*, 1962-1964, 26/27: [illegible]

[illegible] different Divisions of West Pakistan.

8028. [illegible], S., AND [illegible], S.
Cultivation of citrus fruits. *Punjab Fruit J.*, 1962-1964, 26/27: [illegible], illus.

[illegible] on commercial citrus growing in West Pakistan. The subjects covered are environmental conditions, budding, planting (including irrigation), manuring and intercropping, [illegible] and the [illegible] of fruit.

8029. [illegible], M. S.
Some aspects of economics of citrus cultivation *Punjab Fruit J.*, 1962-1964, 26/27: [illegible]

[illegible]

8030. [illegible], N.
[illegible] *Punjab Fruit J.*, 1962-1964, [illegible]

[illegible]

Citrus—varieties, rootstocks and propagation.

(*See also* 7975, 8022, 8026, 8028.)

8031. KHALIDY, R. W.
Description of important citrus varieties grown in Lebanon. [illegible]

Detailed descriptions of the fruit of 15 most important varieties.

8032. [illegible]
[illegible]

[illegible]

3. Ziegler, L. W.
Citrus varieties and rootstocks in Florida. *Punjab Fruit J.*, 1962-1964, **26/27**: 89-91, illus.

4. Khan, M.-u.-D., and Haq, I.
Nomenclature of citrus species in the Punjab. *Punjab Fruit J.*, 1962-1964, **26/27**: 92-6, bibl. 14.
n rootstock varieties are classified according to cies and equivalent English name.

5. Ahmed, S., Rashid, A., and Nazir, H. M.
Citrus roctstock investigations in the former province of Punjab. *Punjab Fruit J.*, 1962-1964, **26/27**: 285-320, bibl. 55, illus.
ormation is given on an investigation which was laid vn in about 1935 to clarify nomenclature by a ailed study of the characters and performance of tstocks from all parts of the subcontinent. Forty e raised from seed and 26 were propagated vegeta- ly. A study was made of root systems (diagrams sented) and of rootstock effects on vigour, cropping, lity and longevity of Sangtra local (*C. nobilis*), lta orange and Marsh Seedless grapefruit. In later eriments rootstock effects on Valencia Late orange, rsh Seedless grapefruit, Kinnow mandarin and Jaffa nge were investigated.

6. Ford, H. W., and Feder, W. A.
Three citrus rootstocks recommended for trial in spreading decline areas. *Circ. Univ. Fla agric. Exp. Stats* **S-151**, 1964, pp. 8, illus.
es, Ridge Pineapple and Milam [see also *H.A.*, 35: 8].

7. Saito, Y., and Yamamoto, S.
The relative influence of two citrus rootstock species, *Poncirus trifoliata* Rafin. and *Citrus junos* Tanaka, upon plant growth and the composition of the scion leaves. [Japanese, with English summary ½ p.] *Bull. Fac. Agric. Miyazaki*, 1963, **9**: 75-88, bibl. 14, illus.
ls are reported in which *P. trifoliata* and *C. junos* e reciprocally grafted on each other. Plants with a oliate rootstock were taller with larger trunks than se on *C. junos* rootstocks. *C. junos* scions produced e leaves. The scion appeared to exert more influ- e on plant dry weight than the rootstock, the plant weight with a *C. junos* scion being 50–100% greater n with a trifoliate scion. Plants with trifoliate root- ks had only a slightly greater dry weight than plants n *C. junos* rootstocks. In experiments in which some tstocks were grafted with 2 scions, the total dry ght of 2 *C. junos* scions was no bigger than that of scion. Two trifoliate scions, however, gave a l dry weight about 50% greater than with a single n. Trifoliate as rootstock tended to increase the nd Mg contents of the scions, especially *C. junos* ns.

8. Ahmed, S., and Rashid, A.
Some studies on the influence of different rootstocks on Kinnow mandarin. *Punjab Fruit J.*, 1962-1964, **26/27**: 224-38, bibl. 19.
ht rootstocks were compared for the Kinnow man- n, a King × Willowleaf cross which is widely planted akistan. Seville Kimb, which is ranked best, gave highest fruit quality and the greatest resistance to ase. Gonsiderable data on performance are ented.

8639. Khan, G. S., and Khan, M.-u.-D.
Effect of Valencia orange scion on different rootstocks. *Punjab Fruit J.*, 1962-1964, **26/27**: 252-4, bibl. 7.
Valencia Late scions invigorated all 3 rootstocks, namely Kharna Khatta, Jullundri Khatti and rough lemon, the mean weights of the root system being greater than when the rootstock itself was used as scion. Valencia Late changed the character of the root systems somewhat, making them more branching and less fibrous.

8640. Ghafoor, A., and Ali, N.
Effect of time of sowing and manuring treatments on the germination of rootstock seeds. *Punjab Fruit J.*, 1962-1964, **26/27**: 276-83, bibl. 2.
Sour orange and Pineapple orange seeds were sown in boxes in a silt-soil mixture. There were 6 sowing dates between mid-September and mid-February and 5 different manures were used. Best results were obtained with September sowing and with cow dung or sheep manure. [See also *H.A.*, 30: 5961.]

8641. Malik, A. S.
Bud union in sweet orange (*Citrus sinensis*) and rough lemon (*Citrus limon*). *Punjab Fruit J.*, 1962-1964, **26/27**: 333-4, bibl. 1, illus.
Histological studies showed that with Valencia Late orange budded on rough lemon satisfactory union takes place after a year, although the stock and scion tissues remain distinct even after union.

8642. Armour, R. P.
Some factors affecting the rooting of citrus species. *Ceiba*, 1965, **11**: 22-50, bibl. 37, illus.
In an experiment in Honduras a comparison was made of 5 species with fair to very poor rooting potential in the order listed: Hamlin orange, Ruby grapefruit, Cleopatra tangerine, Owari Satsuma and Nagami kumquat. Cuttings about 6 in. long of semi-mature wood with the lower 3–4 leaves removed were planted in a peat-perlite mixture after quick-dipping in IBA at nil, 2,000, 3,000 or 4,500 p.p.m. and dusting the basal cut in some cases with captan plus PCNB. Light shade, bottom heat at 80° and 90° F., and misting for 3 sec./min. during daylight were supplied. After 8 weeks a significant increase in rooting was noted at all IBA levels, especially with 80° bottom heat and in the unheated treatment (c. 75°). High temperature in the medium appeared to substitute for higher IBA levels and vice versa. With bottom heat 3,000 p.p.m. IBA was optimum, but without bottom heat 4,500 p.p.m. appeared to be below the optimum. No definite response to fungicide was obtained. The temperature of the medium played an important role, the fastest rooting taking place at the highest temperature and shy-rooting species showing the greatest response at 90°. The use of intermittent mist during the entire 24-hour period is recommended.

8643. Chaudhry, M. S., Ullah, M. H., and Ahmed, S.
Studies on the effect of type of shoot and foliage on the regeneration of roots and shoots of sweet lime cuttings. *Punjab Fruit J.*, 1962-1964, **26/27**: 327-32, bibl. 7.
Nine-inch cuttings from horizontal or vertical one-year-old shoots ½ in. in diam. were planted in February or September either with all leaves removed or with only 1–2 basal leaves removed. February planting and

horizontal shoots were superior, and the removal of all leaves was undesirable.

8644. CHAUDHRY, M. S., ULLAH, M. H., AND AHMED, S.
Some studies on effects of ringing and etiolation treatments on the rooting of sweet lime cuttings. *Punjab Fruit J.*, 1962-1964, **26 27**: 321-6, bibl. 13.

One-year-shoots, ½ in. in diam., were either ringed or etiolated with black tape at the base 3 weeks before removal. With planting in February the percentage strikes of ringed, etiolated and untreated cuttings were 85, 76 and 46, respectively. The corresponding figures for September were 54, 46 and 31, and those for the following February 89, 81 and 53. Figures are given for number, length and weight of roots, for extension growth and for leaf area with the different treatments.

Citrus—climatic factors, soils and soil management.

(*See also* 6927, 7144, 8691.)

8645. (YOUNG, R. H., AND COOPER, W. C.)
Artificial freeze screens citrus. *Agric. Res., Wash.*, 1965, **13**(10): 15.

Hybrid 9-month-old citrus seedlings were hardened under controlled conditions and exposed to 20° F. for 4 hours. The damage was very similar to that caused to the same types of 9-year-old trees by severe frost in Texas in 1962. [See also *H.A.*, 33: 5942.]

8646. STOUT, R. G.
Specific gravity as a means of estimating juice yields of freeze damaged Valencia oranges. *Circ. Univ. Fla agric. Exp. Stats* **S-150**, 1964, pp. 11, illus.

Statistical analysis based on 91 tests indicates that this procedure appears to be sufficiently accurate, simple and inexpensive for use in following the progress of reduction in juice weight of Valencia oranges after a freeze. [From author's summary.]

8647. LOMBARD, P. B., AND OTHERS.
Effects of climatic factors on fruit volume increase and leaf water deficit of citrus in relation to soil suction. *Proc. Soil Sci. Soc. Amer.*, 1965, **29**: 205-8, bibl. 18.

The primary factors affecting the rate of fruit volume increase and leaf water deficit of Navel orange trees were investigated under 2 irrigation treatments. One treatment was applied when tensiometers in the major root zone indicated 20 centibars soil suction and the other treatment was applied at 100 cb. soil suction. The correlations between either fruit volume increase or leaf water deficit and various environmental conditions were studied by factor analysis to determine possible primary factors affecting the water status of the trees. Soil suction, a primary factor in both treatments, influenced the fruit and the leaf in only the 100-cb. treatment. Rate of water movement through the soil to the plant roots could be the underlying factor. Another factor, evaporation power of the atmosphere during high diurnal transpiration, affected the rate of fruit volume increase in only the 100-cb. treatment. [Authors' abstract. See also *H.A.*, 34: 1453.]—Univ. Calif., Riverside.

8648. TANBARA, K., KURIHARA, H., AND SONE, T.
On the relationship between productivity an physical properties of Satsuma orange soils. Pa 2. On the characteristics of the soils in the agr cultural region of the Setonaikai area.
TANBARA, K., AND KURIHARA, H.
Idem. Part 3. On the soil water system Satsuma orange orchard soils. *J. Sci. So Manure*, 1964, **35**: 341-76, from abstr. in *Soil Sc Plant Nutrit.*, 1965, **11**: 96-7.

The soils are described. Root and shoot growt decreased with reduced aeration and increased con paction of the soil, and were poorest when the no capillary pore content of the subsoil was less than 15% Yield was also related to soil moisture and aeratio [For earlier part see *H.A.*, 35: 1832.]—Ehime Pre agric. Exp. Stat.

8649. SAKAMOTO, T., OKUCHI, S., AND YAKUSHIJI, K
Effects of the physical and chemical properties soils derived from different matrices on the grow of Satsuma orange trees. I. On the growth young Satsuma orange trees in pot experiment [Japanese, with English summary ½ p.] *J. Ja Soc. hort. Sci.*, 1964, **33**: 280-6, bibl. 14, illus

In 4 years' trials shoot growth, yields and trunk circu ference were studied on potted 2-year-old Miyaga Wase orange trees growing in 6 types of soil. Maximu growth and yields throughout the experimental perio were obtained in trees raised in Sekizen soil which wa slightly acid or alkaline and rich in exchangeable cation Applied N was very effective in this soil. In the oth soils tested no clear relationship was found between t chemical composition of the soil and tree growth.

8650. RICHARDS, S. J., WARNEKE, J. E., AND MOOR P. W.
Container grown citrus seedlings. *Calif. Citrog* 1965, **50**: 323-6, bibl. 3, illus.

The growth was compared of sweet orange seedling grown for 6 months in containers of 3 different sizes i the proportions of 1 : 2 : 8. There was a 50 increase in seedling height and a 100% increase in tot root weight between seedlings grown in the smallest an largest containers, with intermediate increases in t middle-sized container. The use of VAMA to impro the aggregation and water conductivity of the soil ha only a small effect on the growth and vigour of the plant Irrigation management was based on tensiometers a water did not appear to be a limiting factor.—Uni Calif., Riverside.

8651. HAGIN, J., LIFSHITZ, Z., AND MONSELISE, S.
The influence of soil aeration on the growth citrus. *Israel J. agric. Res.*, 1965, **15**: 59-64 bibl. 9.

The influence was studied of soil texture change on th growth of sweet lime (*C. limettioides*) and sour orang (*C. aurantium*). Differences in aeration ratio wer obtained by growing seedlings in a clay soil, in a sand soil and in 3 mixtures of these soils. Oxygen diffusio rates and porosity were significantly different in the experimental soils. Growth was generally greatest i the sandy loam soil. Sweet lime was shown to be mo sensitive than sour orange to changes in aeratio [From authors' summary.]—Technion-Israel Ins Technol., Haifa, Minist. Agric., Jerusalem, and Hebre Univ., Rehovot.

52. Young, T. W., and Pierce, P.
The economy of adequate drainage for citrus in Florida coastal area. *Punjab Fruit J.*, 1962-1964, **26/27**: 167-70.

a study of 20 soils the average increase in soil moisture ailability resulting from lowering the water table from to 4 ft. was 1·37 acre-in. or 56%.

53. Vardzelašvili, M. G.
Changes in the temperature regime of orchard soil under the influence of different methods of management. [Georgian, with Russian summary.] *Tr. Gruz. sel'sk. Inst.*, 1962, **58**: 99-106, from *Ref. Ž. (55. Rasten.)*, 1964, Abstr. 10.55.286.

il temperatures at depths of 5, 10, 15 and 20 cm. ere measured in the inter-rows of clean cultivated, assed and mulched plots of mandarins. In the mmer the highest monthly mean temperature was corded under clean cultivation and the lowest under ulch. In the winter the monthly mean under mulch as 1·3–1·5° C. higher than that under clean cultiva- on, which was characterized by greater diurnal and asonal temperature fluctuations. The difference tween temperatures in the 0–5-cm. and 10–15-cm. il layers was 9·1°, and between the surface tempera- re and that in the 10–15-cm. layer as much as 39·6° C.

54. Till, M. R., and Cox, J. B.
A guide to cultural practices for young citrus trees. *J. Agric. S. Aust.*, 1965, **68**: 232-3, illus.

oot distribution studies on large 2-year-old Valencia ange trees showed that 90% of the roots occurred thin 3 ft. of the tree and that more than ⅔ were within ft. The results are discussed in relation to cultural actices.

55. Ryan, G. F.
Effects of herbicides on growth and yield of orange trees. *Citrus Veg. Mag.*, 1965, **28**(10): 22-3, 25, bibl. 5.

ials are reported on the effects of diuron, simazine d dalapon plus diuron or simazine on the growth and elds of 1-year-old Pineapple and 7-year-old Valencia ange trees. In all treatments tree growth and yields er 3 or 4 years were better than those of the controls. me symptoms of toxicity were produced on plots ated with diuron at 6·4 lb./acre. There was no idence that the herbicides stimulated tree growth or ld except by reducing weed competition. [See also *A.*, 35: 1826.]—Univ. Fla, Lake Alfred.

56. Tribe, A. J.
Progress report—herbicides in citrus. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, p. 1.

omacil at 3 lb./acre in 50 gal. spray, which provided ed-free conditions for 12 weeks without injury to ear-old citrus trees, was the most promising of 5 rbicides evaluated at Serere in July, 1964.—Serere s. Stat., Uganda.—*Weed Abstr.*, **14**, No. 100.

57. Khan, M.-u.-D., and Tirmazi, S. S.
The chemical control of Johnson grass (*Sorghum halepense* Pers) in citrus orchards. *Punjab Fruit J.*, 1962-1964, **26/27**: 171-3, bibl. 3.

an experiment in which dalapon, TCA and amitrole re compared, each at 2 rates, dalapon at 20 lb. in) gal. per acre gave the best control, viz. 96–98% en applied in June and 89–92% when applied in otember. [See also *H.A.*, 33: 4540.]—Ayub agric. s. Inst., Lyallpur.

Citrus—nutrition.

(*See also* 7177, 7658, 8649, 8677, 8695.)

8658. Reuther, W.
Leaf analysis as a means of diagnosing the nutrient status of citrus. *Punjab Fruit J.*, 1962-1964, **26/27**: 122-6, bibl. 12.

A brief review on standards, sampling, interpretation and limitations.

8659. le Roux, F. H.
Leaf analysis—a new approach in citrus fertilization. *Fmg S. Afr.*, 1965, **41**(3): 65-6, 69-70.

General NPK fertilizer programmes based on tree size are suggested for citrus on light acid, heavy acid and alkaline soils.—Citrus subtrop. Fruit Res. Inst., Nelspruit.

8660. Ali, S.
Some experiments on the manuring of citrus in the Punjab. *Punjab Fruit J.*, 1962-1964, **26/27**: 108-19.

Notes are given on NPK manuring experiments on orange, mandarin and grapefruit begun at the Horticultural Research Sub-station at Attari (now in East Punjab) in 1944 and brought to a halt in 1946 by the partition of the sub-continent. The inconclusive results of 2 years' observations are discussed.

8661. Saito, Y., and Yamamoto, S.
The relative influence of differential supplies of nitrogen and types of growth regulator on citrus seedlings in sand culture. I. *Citrus intermedia* Hort. ex Tanaka. II. *Citrus junos* Tanaka. [Japanese, with English summaries ⅓ and ¼ pp.] *Bull. Fac. Agric. Miyazaki*, 1964, **10**: 61-71, bibl. 9; and 1965, **10**: 234-44, bibl. 9.

Plant growth in both species was greatest with N applied at 80 p.p.m. with or without growth substances (GA, IAA, NAA and MH). With applications of N at 40 p.p.m. growth was greater in the absence of growth substances, but at 160 p.p.m. growth was better in the presence of growth substance. GA increased plant height but reduced fresh weight and root growth. The leaf-N content rose with increasing N applications and was only slightly affected by growth regulator treatment. [See also *H.A.*, 34: 3589.]

8662. Jones, W. W., and Embleton, T. W.
Urea foliage sprays. *Calif. Citrogr.*, 1965, **50**: 334, 355-9, bibl. 16, illus.

A review of studies in California on urea foliar sprays for citrus, and dealing with the absorption and metabolism of urea, the concentration, frequency and timing of applications, yield and quality effects, and biuret relations. Suggestions are made for the foliar application of urea to bearing and non-bearing trees.—Univ. Calif., Riverside.

8663. Démétriadès, S. D., and Gavalas, N. A.
Biuret toxicity in citrus trees in Greece. *Ann. Inst. phytopath. Benaki*, 1964, **7**: 55-6, bibl. 9, illus.

Marked chlorosis of lemon leaf tips and, to a lesser degree, grapefruit leaf tips was observed in a 1963 survey and found to be due to the high biuret content of the pelletized urea used as a 1% foliar spray. The biuret content of samples was 1% compared with the recommended maximum of 0·25%.

8664. MARTIN, J. P., AND PAGE, A. L.
Influence of high and low exchangeable Mg and Ca percentages at different degrees of base saturation on growth and chemical composition of citrus plants. *Plant and Soil*, 1965, **22**: 65-80, bibl. 27.

Soils containing about 5–10% exchangeable Mg were deficient for citrus or were approaching deficiency levels. Leaf Mg values of sweet orange growing in pots containing these soils varied from 0 15 to 0·20%. Added K reduced the leaf Mg of plants grown in one soil to 0·10%. Leaf Ca did not reach presumably deficient levels until the exchangeable soil Ca was reduced to about 15%; at this level the leaf Ca was 0·5–0·7%. Low leaf Ca was not associated with consistent leaf patterns. When the soil exchangeable-Mg percentages exceeded about 50%, plant growth was significantly reduced. Growth reduction was associated with leaf Mg percentages of over 0·9. Leaf Mg levels were very highly correlated with soil exchangeable Mg, and leaf Ca with soil exchangeable Ca. High soil acidity (< pH 5) reduced the growth of orange seedlings. Reduced growth in general was not associated with leaf symptoms or with deficiency levels or excesses of leaf constituents and is presumed to be caused by Al toxicity to the roots. At the lowest pH values, however, P and Ca deficiency, and Ni excess may have contributed to the reduced growth effect. [From authors' summary. For earlier work see *H.A.*, 33: 3798.]—Univ. Calif., Riverside.

8665. ALI, M., ALI, S., AND KHAN, M.-U.-D.
Vigour and productivity as affected by trace elements in citrus. *Punjab Fruit J.*, 1962-1964, **26/27**: 120-1.

Brief notes without data on experiments with Cu, Zn, Mn, Fe and Co on Pineapple orange trees growing in an alkaline sandy loam soil.

8666. PARKASH, V., AND SUBBIAH, B. V.
Radioisotopes in micronutrient studies. I. Distribution of ^{32}P in citrus seedlings under deficient or toxic conditions of different micronutrients. *Soil Sci. Plant Nutrit.*, 1965, **11**: 1-8, bibl. 12, illus.

Forty-five-day-old seedlings of rough lemon were subjected to Fe, B, Cu and Mn deficiencies and toxicities in solution cultures. The autoradiographic technique was adopted for investigating the pattern of absorption and distribution of P^{32}, which was applied when the seedlings exhibited characteristic symptoms of deficiencies and toxicities. Absorption and accumulation were hampered in Cu-deficient and B-toxic cultures. Fe-deficiency cultures showed uptake of P^{32} and its accumulation in the conducting tissues, but its metabolic utilization by the mesophyll tissues was affected. In the remaining cultures absorption of P^{32} was more or less normal, except that accumulation occurred in the veins with Fe-, Cu- and Mn-toxic and in the petioles with B- and Mn-deficient cultures. [From authors' summary.]—Indian agric. Res. Inst., New Delhi.

8667. PARKASH, V., AND PUSHPALATA, —.
Copper and molybdenum deficiencies in different species of citrus. *Indian J. agric. Sci.*, 1965, **35**: 69-78, bibl. 10, illus.

Cu and Mo deficiencies were induced in solution cultures of rough lemon, sweet lime (*C. limettioides*), baduvapuli (*C. pennivesiculata*), sour orange and mandarin. The symptoms are described. Mo deficiency symptoms developed on rough lemon within 15 days, continued for 3–4 weeks and reappeared after 21–22 weeks. On baduvapuli the symptoms appeared after 3 we
persisted for 2 weeks and reappeared 16–17 weeks la
Sweet lime exhibited symptoms after 25 weeks. M
darin and sour orange exhibited no symptoms other t
restricted growth and pale-green foliage. When Cu
deficient sour orange, baduvapuli and rough le
developed symptoms after 25–30 weeks and manda
after 30–31 weeks. Sweet lime suffered only stur
growth. [See also *H.A.*, 34: 5562.]—Indian agric.
Inst., New Delhi.

8668. BERNSTEIN, L.
Salinity and citrus. *Calif. Citrogr.*, 1965,
273-6, bibl. 10.

A review on toxic effects and permissible concentrati
of salts in the soil, salt accumulation in ridges,
control of salinity by irrigation, the use of fertili
during leaching, the frequency of irrigation and
amendments.

8669. ELGAZZAR, A., WALLACE, A., AND HEMAIDAN
**Sodium distribution in rough lemon and trifol
orange seedlings.** *Soil Sci.*, 1965, **99**: 387
bibl. 18.

Essentially, Na from $Na^{22}Cl$ solutions was absor
equally by small trifoliate orange and rough le
seedlings but more of it was translocated to leave
rough lemon than to leaves of trifoliate orange.
either case Na was mostly retained in the ro
Several different pieces of evidence indicated that
translocation through the wood of trifoliate orang
slower than through that of rough lemon. Cya
stimulated translocation of Na to shoots in both spe
Transpiration seemed to increase both uptake
translocation of Na. Glucose at 10^{-2} *M* incre
Na uptake. [Authors' summary.]—Univ. Calif.,
Angeles.

Citrus—disorders and diseases.

(*See also* 8693, 8744-8747.)

8670. MATSUMOTO, K.
**Studies on granulation in late-maturing oran
especially the Sanbokan variety.** [Japanese,
English summary 1½ pp.] *Mem. Ehime U
Sect. VI (Agric.)*, 1964, **10**: 585-645, bibl.
illus.

Cytological, histological and physiological studies
granulation are reported and the characteristics
described. The disorder appeared to be more comm
on vigorous trees which had received N applicati
and in large fruit from branches bearing a light c
High atmospheric temperatures in the spring favou
the development of the disorder.

8671. TAL, D., AND MONSELISE, S. P.
Corky (silvery) spots on the rind of citrus fr
Israel J. agric. Res., 1965, **15**: 73-81, biol.
illus.

Different types of spot, herein described and define
"spreading" or "non-spreading", were studied on
rind of Shamouti oranges and Marsh Seedless gra
fruit. The results suggested that spreading spots
be caused by increased pressure due to uneven gro
of the endocarp, inducing splitting of stomata
successive filling of splits by cork, in a manner sim
to suberization of branches. Climatic factors, wh
had previously been considered as direct causes of
trouble, may be indirectly responsible through t
action on the growth rate of the endocarp. [Auth
summary.]—Hebrew Univ., Rehovot.

2. DUCHARME, E. P., AND SUIT, R. F.
Citrus tree decline. *Punjab Fruit J.*, 1962-1964, **26/27**: 138-42, 133, illus.

nptoms of the different types of decline due to fungal virus disease, nematode attack, nutritional deficiency, ter damage or lightning injury.

3. WANG, H.
Citrus viruses and their control. [Chinese, with English summary ⅔ p.] Reprint from *China Hort.*, 1964, **10**(1/2), pp. 7, bibl. 24.

eview.

4. ELSAID, H. M., AND SINCLAIR, J. B.
Use of stains and pathological histology to detect virus infection in citrus. *Phytopathology*, 1965, **55**: 543-5, bibl. 21.

22 stains tested proflavine sulphate and thionin were nd useful in detecting psorosis virus infection, and hyl orange and thionin in detecting tristeza virus ction in sour orange stems. Pathological histology sour orange stems infected separately with each of 4 ses showed no differences between controls and cortis- or xyloporosis-infected plants. Psorosis-cted sour orange stems were characterized by oem necrosis and crystal formations in xylem vessels. tristeza-infected sour orange phloem necrosis was sent in roots and stems; in stems, chromatic cells e found in phloem and xylem rays. Tristeza-cted Key lime roots were characterized by phloem rosis and chromatic cells in rays of phloem and em. Psorosis-infected sour orange roots were racterized by enlarged vascular rays in the periderm. cortis-infected trifoliate orange roots contained rotic phloem. [From authors' abstract. See also ., 35: 6500.]—La St. Univ., Baton Rouge.

5. ELSAID, H. M.
Pathological histology of young sour orange plants bud-inoculated with four citrus viruses. From abstr. in *Phytopathology*, 1964, **54**: 892.

details see previous abstract.

6. CHILDS, J. F. L., AND KNORR, L. C.
Control of virus diseases of citrus trees—an evaluation of methods. *Phytopathology*, 1965, **55**: 675-80, bibl. 49.

exing of rigorously selected, apparently healthy, -line citrus trees in Florida showed them to be widely cted with viruses (5·5% with tristeza, 6·8% with rosis, 50% with exocortis and 72% with cachexia). dling trees and new-line trees were mostly virus free. testing proved expensive, slow and not wholly quate, because only 4 viruses were indexed of more n 12 now recognized. Because conclusive evidence eed transmission of citrus viruses is unknown and st citrus varieties grow true to type from seed by on of nucellar embryony, it is more economical of and effort to develop virus-free lines of com-cially important varieties by testing nucellar seed-s. Virus disease control through use of virus-free wood is becoming a critical factor in many areas. thors' abstract.]—U.S. Dep. Agric., Orlando, and us Exp. Stat., Lake Alfred, Fla.

7. WEATHERS, L. G.
Nitrogen as a factor in the development of exocortis of citrus. *Phytopathology*, 1964, **54**: 968-9, bibl. 9.

us plants, grown in nutrient solution cultures under ditions of uniform nutrition, were supplied with varying amounts of N and inoculated with exocortis virus. Stunting occurred in all treatments, but bark scaling occurred only with high concentrations of N even though growth of the host, due to excess N, was reduced. The incubation period of the virus was reduced in plants receiving excess N. [From author's abstract.]—Univ. Calif., Riverside.

8678. MCCLEAN, A. P. D., AND OBERHOLZER, P. C. J.
Greening disease of the sweet orange: evidence that it is caused by a transmissible virus. [Afrikaans and French summaries 1½ pp. each.] *S. Afr. J. agric. Sci.*, 1965, **8**: 253-76, bibl. 13, illus.

The disease adversely affects the quality of the fruits, but is primarily one of the tree: it causes general stunting and symptoms in the foliage of which the most important is a mottle of the older leaves. Either the whole tree is affected or only a part of it. The disease spreads in the field and it can be perpetuated by vegetative propagation including grafting. The inconsistency of the results and the fact that more results are negative than positive indicate that greening virus has a restricted distribution in the tree. There is evidence that the virus does not move readily in the tree and may remain confined to branches. The virus may also be sensitive to temperature. When sweet oranges, growing in containers, were exposed in an orchard where greening was plentiful, some developed the foliage symptoms of the disease. The test trees were not in contact with the soil or affected trees. It is inferred that the infection was transmitted to the trees by an insect vector. Of the described virus diseases of citrus, greening most resembles stubborn: both cause stunting and adversely affect the fruit. [From authors' abstract.]—Plant Protect. Res. Inst. and Univ., Pretoria.

8679. MCCLEAN, A. P. D., AND OBERHOLZER, P. C. J.
Citrus psylla, a vector of the greening disease of sweet orange. *S. Afr. J. agric. Sci.*, 1965, **8**: 297-8.

The first positive transmission is reported of a virus, believed to be that of greening, by adult citrus psylla (*Trioza erytreae*). The citrus aphid (*Toxoptera citricidus*) did not transmit the disease, nor did psylla nymphs.

8680. PAPASOLOMONTOS, A.
The present status of impietratura, a citrus disease, in Cyprus. *Plant Dis. Reptr*, 1965, **49**: 111-13, bibl. 3, illus.

A new destructive disorder of grapefruit has been observed in Cyprus in recent years. Diseased fruit are characterized by skin hardening, with or without protuberances, and albedo gumming. Experiments have indicated that the disease is caused by a virus and that it can be transmitted by budding to both grapefruit and Valencia orange trees. The symptoms on Valencia oranges are similar to those on grapefruit. [Author's abstract.]—Agric. Res. Inst., Nicosia.

8681. DISKIN, S., AND MONSELISE, S. P.
Some fruit characteristics of Shamouti oranges as affected by stubborn disease. [French and Italian summaries ⅛ p. each.] *Phytopath. medit.*, 1965, **4**: 21-4, bibl. 11.

A one-sided deformity of the fruit is the most characteristic feature of the disease. Data collected from normal fruits produced on normal and diseased trees, and from the normal and deformed parts of affected fruits, showed, in that order, reductions in peel thickness, cell size and dry matter content per unit area, and increases in the water and phenol contents of the peel. In the juice the soluble solids content and the ratio of this to acids decreased, and the citric acid content increased, denoting delayed maturity as an effect of the disease.—Hebrew Univ., Rehovot, Israel.

8682. Ríos Castaño, D., and Giacometti, D. C.
La tristeza de los cítricos en Colombia. **(Tristeza disease of citrus in Colombia.)** [English summary 13 lines.] *Agric. trop., Bogotá*, 1965, **21**: 161-9, bibl. 23, illus.

Investigations showed that the disease exists in Colombia on Meyer lemon, Rustic citrange and 5 orange varieties, viz. Washington Navel, Mediterranean Sweet, Macaé, Wialua and Indian River.

8683. Arif, A. G., Akhtar, M., and Ibrahim, M.
Citrus diseases and their control. *Punjab Fruit J.*, 1962-1964, **26**/**27**: 369-73, bibl. 24, illus.

Symptoms and control of wither tip (*Colletotrichum gloeosporioides*), bacterial canker (*Xanthomonas citri*), nursery wilt, sooty mould (*Capnodium citri*), gummosis (*Phytophthora* spp.), black rot (*Alternaria citri*), scaly bark and canker, and chlorosis.

8684. Reichert, I.
A northern bacterial invader in citrus plantings. A pathogeographical study. *Ann. Inst. phytopath. Benaki*, 1964, **6**: 146-55, bibl. 25.

The distribution, ecology, origin and migration of *Pseudomonas syringae* are discussed. The ecological prerequisite for the development of blast and black pit on citrus appears to be a monthly rainfall averaging at least 150 mm. for 3 months, coupled with a temperature not exceeding 20° C.—Rehovot, Israel.

8685. (Kiely, T. B.)
Control of Emperor mandarin brown spot. *Agric. Gaz. N.S.W.*, 1965, **76**: 178.

Of 6 treatments tested thiram at 44 oz. per 100 gal. gave the best control of *Alternaria citri* on calamondin seedlings. [See also *H.A.*, 34: 5595.]

8686. Reichert, I., and Chorin, M.
A new sooty blotch on citrus. [Italian and French summaries $\frac{1}{6}$ p. each.] *Phytopath. medit.*, 1965, **4**: 12-16, bibl. 9, illus.

On orange and grapefruit leaves and fruits in Israel, designated as *Caenothyrium citri* n. sp.

8687. Cohen, M.
Greasy spot in Florida—its control and apparent cause. *Punjab Fruit J.*, 1962-64, **26**/**27**: 364-8, bibl. 7.

The most effective materials tested for the control of *Cercospora* sp. were tribasic copper sulphate and oil [see also *H.A.*, 30: 6017].

8688. Yamada, S., Yamamoto, S., and Tanaka, H.
Studies on anthracnose tear stain of citrus fruits. I. The causal fungus and its host range.
Tanaka, H.
Idem. II. Acervulus-free conidia of the causal fungus (*Colletotrichum gloeosporioides*). [Japanese, with English summaries $\frac{2}{3}$ and $\frac{1}{2}$ pp.] *Bull. hort. Res. Stat. Shizuoka, Ser. B* (*Okitsu*), 1965, No. 4, pp. 107-17, bibl. 7, illus.; and 119-26, bibl. 7.

8689. Anon.
Control de la sarna del limonero. **(Control**
lemon scab.) *Publ. misc. Estac. exp. agr*
Tucumán, 1964, No. 15, pp. 106-8, illus., fr
Trop. Abstr., 1965, **20**, Abstr. n1547.

Effective control of *Elsinoë fawcetti* on Eureka lem
trees was obtained with Cu oxychloride, Cu-zineb (wi
or without the addition of 1–1·5% oil), ferbam
quinolate at 0·2–0·4% concentration applied at 10
per tree when the fruits were 1 inch in diam. and agai
month later.

8690. Childs, J. F. L., Kopp, L. E., and Johnso
R. E.
A species of *Physoderma* present in citrus a
related species. *Phytopathology*, 1965, **55**: 681-
bibl. 25, illus.

A fungus, identified as a chytrid of the *Physoderm*
Urophlyctis group and named *Physoderma citri* sp. no
was found in all citrus species, hybrids and relativ
examined. The ability of the fungus to grow in t
host tissues without causing noticeable symptoms
disease suggests that a delicate balance exists betwe
the requirements of the organism and its host. [Fro
authors' abstract.]—U.S. Dep. Agric., Orlando, Fla.

8691. Stolzy, L. H., and others.
Soil aeration and root-rotting fungi as factors
decay of citrus feeder roots. *Soil Sci.*, 1965,
403-6, bibl. 11, illus.

Soil aeration is shown to be a factor in root de
of citrus but is not of itself a contributing factor
causing root-rot by *Phytophthora* spp. Oxygen dif
sion rates of about 0·22 μg. per sq. cm. per min.
cause a marked reduction in root growth of cit
plants without a similar reduction in top growth und
an ideal environment. Oxygen diffusion rates
0·11 μg. per sq. cm. per min. can cause considera
damage to established plants which appeared to
independent of the root-rotting fungi. [Autho
abstract. See also *H.A.*, 35: 6506.]—Univ. Cali
Riverside.

8692. Klotz, L. J., and DeWolfe, T. A.
Tetrazolium, an indicator of extent of infection
***Phytophthora* root rot of citrus.** *Plant D*
Reptr, 1965, **49**: 423-4, bibl. 6, illus.

The method described, using seedlings for the evaluati
of prospective rootstocks.

Citrus—pests.

(*See also* 8636.)

8693. Brzeski, M. W.
Nematodes associated with citrus trees infected
four viruses and comments about nematode dist
bution in Florida citrus groves. *Plant Dis. Rep*
1965, **49**: 610-14, bibl. 18.

Tabulated data are presented indicating the associati
of 41 nematodes with citrus trees infected with tristez
xyloporosis, psorosis and exocortis viruses.
apparent correlation was found between the occurren
of individual nematode species and the viruses.

8694. Cohn, E.
On the feeding and histopathology of the cit
nematode. [French summary 10 lines.] *Nem*
tologica, 1965, **11**: 47-54, bibl. 19, illus.

Damage caused by *Tylenchulus semipenetrans* on ro
of Israeli sweet lime and sour orange.

595. Labanauskas, C. K., Baines, R. C., and Stolzy, L. H.
Effects of citrus nematode (*Tylenchulus semipenetrans*) and two levels of water suction on nutrient concentrations in Navel orange leaves and roots. *Soil Sci.*, 1965, **99**: 367-74, bibl. 20.

he leaves and roots from Navel orange trees were nalysed for 11 nutrients and Na. The presence of ematodes on the roots affected the concentrations of veral nutrients. The decrease or increase in nutrient oncentrations in plant tissue was insignificant from the actical point of view, since the concentrations in the aves remained in the adequate range. Citrus roots own in soils irrigated at 9 centibars contained lower umbers of nematodes than did roots grown in soils igated at 60 centibars. Leaves of citrus trees irrigad at 9 centibars contained lower concentrations of Ca d Mg than did leaves from trees irrigated at 60 centirs. The roots sampled from the deeper layers of soil ntained higher concentrations of N, Mg, Na, Cl and than did the roots sampled from the upper layer of il. Since the less-soluble nutrients (P, K and Zn) ere retained in the upper layer of soil, concentrations these nutrients found in the roots were higher in mples from the first 38-cm. depth. Foliar applicaons of Cu bordeaux to orange trees increased Cu conntration in the leaves but failed to overcome the gative effect of nematodes on the vegetative growth of rus plants. Thus, the effects of nematodes on mineral trient uptake by citrus roots are only incidentally volved in reduced growth when there is a readily ailable nutrient supply in the soil. The primary use or causes of damage on total plant economy may due to reduction in both quantity and quality of small eder roots. [From authors' abstract.]—Univ. Calif., verside.

96. Van Gundy, S. D., and Kirkpatrick, J. D.
Factors explaining citrus nematode resistance. *Calif. Citrogr.*, 1965, **50**: 235-41, bibl. 1, illus.

e *H.A.*, 34: 5606.

97. Cohn, E., and Minz, G.
Application of nematocides in established orchards for controlling the citrus nematode, *Tylenchulus semipenetrans* Cobb. [French and Italian summaries ¼ p. each.] *Phytopath. medit.*, 1965, **4**: 17-20, bibl. 9.

nem (0,0-diethyl 0-2-pyrazinyl phosphorothioate) at and 40 kg./ha. a.i. in a granular formulation, worked o the soil and followed by sprinkler irrigation, failed control nematodes. Diazinon at 1 c.c./sq. m. a.i., plied as spray and in irrigation basins, also failed to duce nematode populations, and at 15 times that rate duced infestation by about 30%. Basin application DBCP at 25 l./ha. a.i. reduced nematode population vels by about 70%, and at 50 l./ha. gave almost comete control. When applied through a sprinkler irrigaon system DBCP application rates for a light soil eded to be more than double those required for basin plication. For a heavy soil, however, basin applicaon of DBCP was inadequate for nematode control.—olcani Inst. agric. Res., Rehovot, Israel.

98. Oteifa, B. A., Shafiee, F. A., and Eissa, F. M.
Efficacy of DBCP flood irrigation in established citrus. *Plant Dis. Reptr*, 1965, **49**: 598-9, bibl. 3.

ood control of nematodes (predominantly *Tylenchulus nipenetrans*) was achieved by applying DBCP (75% ulsion) in irrigation water at rates of 1, 2 or 4 gal./feddan. Tree growth was markedly improved and yields were increased significantly.—Cairo Univ., U.A.R.

8699. Baines, R. C., Small, R. H., and Stolzy, L. H.
DBCP recommended for control of citrus nematode on bearing trees. *Calif. Citrogr.*, 1965, **50**: 333, 342-4.

The beneficial effects on yield and size are discussed of nematode control using DBCP at 2–5 gal./acre on bearing grapefruit, lemon, and Navel and Valencia orange trees. [See also *H.A.*, 34: 5607.]—Univ. Calif., Riverside.

8700. Schwartz, A.
Control bud mites in citrus orchards. *Fmg S. Afr.*, 1965, **41**: 57, 59-60, illus.

Symptoms and seasonal damage caused by *Aceria sheldoni* are described. Recommended control is by sprays of medium summer oil emulsion, micro-sulphur, lime-sulphur or chlorobenzilate (25% w.p., 1 lb. in 100 gal.).

8701. Elmer, H. S.
The Yuma spider mite, *Eotetranychus yumensis*, on citrus. *J. econ. Ent.*, 1965, **58**: 534-6, bibl. 7.

Temperatures between 80° and 90° F. and R.H. under 50% were most conducive to population increases of the Yuma spider mite. Sulphur, applied as a dust or spray when the mites appeared, effectively reduced injurious populations. [From author's abstract.]—Univ. Calif., Riverside.

8702. Elmer, H. S., and Jeppson, L. R.
Citrus red mite in Coachella Valley. *Calif. Citrogr.*, 1965, **50**: 311-13, bibl. 3.

Climatic and other possible factors in the recent increased spread of *Panonychus citri* are discussed.

8703. Jeppson, L. R., Jesser, M. J., and Complin, J. O.
Response of susceptible strains of the Pacific spider mite and the citrus red mite to *O*-isopropyl *O*-(2,4,5-trichlorophenyl) phosphoramidate or phosphoramidothioate. *J. econ. Ent.*, 1965, **58**: 466-7, bibl. 3.

A laboratory strain of *Tetranychus pacificus* was relatively slow in developing resistance to *O*-isopropyl *O*-(2,4,5-trichlorophenyl) phosphoramidothioate or the phosphoramidate under selection pressure, as compared with the response of this strain to demeton and parathion. In large-scale field tests, however, the citrus red mite, *Panonychus citri*, developed resistance to this phosphoramidothiate after 6 applications and to the phosphoramidate as a result of 3 treatments. [From authors' abstract. See also *H.A.*, 35: 4390.]—Univ. Calif., Riverside.

8704. Byron, P. A., and Díaz P., R.
Principales plagas de los cítricos en Guatemala. **(The main citrus pests in Guatemala.)** *Bol. téc. Inst. agropec. nac.*, 1964, No. 8, pp. 1-30, bibl. 6, illus., from *Trop. Abstr.*, 1965, **20**, Abstr. n1549.

Including control measures for leaf-cutting ants (*Atta* spp.), scales (*Lepidosaphes beckii*, *Chrysomphalus aonidum*, *Icerya purchasi*, *Saissetia hemisphaerica*), aphids (*Aphis spiraecola*, *A. gossypii*, *Toxoptera aurantii*) and fruit flies (*Anastrepha* spp.).

8705. Haq., K. A., and Akmal, M. M.
Insect pests of citrus and their control. *Punjab Fruit J.*, 1962-1964, **26/27**: 376-92, bibl. 11, illus.

Description and control of 16 citrus pests of Pakistan, viz. *Diaphorina citri*, *Dialeurodes* spp. *Aleurocanthus* spp., *Aleurolobus* spp., *Aleurotuberculatus murrayee*, *Aonidiella aurantii*, *Drosicha stebbingi*, *Phyllocnistis citrella*, *Papilio demoleus* and *Dacus* spp.

8706. Searle, C. M., St. L.
A list of the insect enemies of citrus pests in Southern Africa. *Tech. Commun. Dep. agric. tech. Serv., Pretoria*, **30**, 1964, pp. 57.

8707. Musgrove, C. H., and Carman, G. E.
Argentine ant control on citrus in California with granular formulations of certain chlorinated hydrocarbons. *J. econ. Ent.*, 1965, **58**: 428-34, bibl. 15.

Studies are reported on suitable granules for use as substrates for insecticides used for ant (*Iridomyrmex humilis*) control in citrus groves. Granular formulations were slightly more effective than spray formulations when equivalent amounts of toxicant per acre were applied. The practical dosage rate for granular treatments was 50–100 lb./acre. Uniformly dispersed over the surface of the ground, these materials were effective for periods exceeding 10 months in greatly reducing or actually eliminating ant colonies. Dispersal by aircraft was the most effective method tested for applying granules. Residues occurring on and in the peel of fruit treated with air dispersions of chlordane and dieldrin granules were determined to be below established tolerances, and considerably lower than reported residues resulting from the use of these materials as aqueous sprays. [From authors' abstract. See also *H.A.*, 33: 3857.]—Univ. Calif., Riverside.

8708. Smith, H. D., Maltby, H. L., and Jiménez Jiménez, E.
Biological control of the citrus blackfly in Mexico. *Tech. Bull. U.S. Dep. Agric.* **1311**, 1964, pp. 30, bibl. 30, illus.

Three parasites introduced between 1948 and 1950, *Amitus hesperidum*, *Prospaltella clypealis* and *P. opulenta*, have become dominant in controlling *Aleurocanthus woglumi*, and the native predator *Delphastus pusillus* is present in all citrus regions. The blackfly is considered (September 1962) to be satisfactorily controlled in the entire biological control zone of Mexico.

8709. Rubin, A.
***Contarinia citri* Barnes—a pest of citrus new to Israel.** *Israel J. agric. Res.*, 1965, **15**: 103-4, bibl. 5.

A description is given of the citrus blossom midge and the damage it causes. Two hymenopterous parasites were found, one of which was identified as *Systasis encyrtoides*.—Citrus Mktg Bd Israel, Rehovot.

8710. Ghose, S. K.
Control of orange coccid, *Labioproctus polei* Green (Margarodidae, Hemiptera). *Indian J. agric. Sci.*, 1965, **35**: 32-8, bibl. 2.

In a trial of various concentrations of malathion, parathion, Tenac, nicotine sulphate, lime-sulphur solution, kerosene emulsion and Albolineum No. 1 no treatment was effective, but Tenac appeared to enhance the effect of parathion while reducing those of malathion and nicotine sulphate. In a second experiment 0·062% parathion with 0·2% Tenac gave complete control of third nymphal and young adult females. In a third experiment 96–99% control was obtained with 0·02, 0·03 and 0·04% parathion+0·25% Tenac and with 0·02% parathion+0·25% Albolineum No. 1. In th last experiment effective control was also obtained wit 0·02% parathion alone or combined with 0·05–0·45 Albolineum No. 1. Spraying with 0·02% parathion 0·25% Albolineum No. 1 is recommended again second instar nymphs in early February.—Jute agri Res. Inst., Barrackpore, W. Bengal.

8711. Anon.
Ensayo comparativo de atractivos de mosca d los frutos. **(Comparative trial with fruit fl attractants.)** *Publ. misc. Estac. exp. agric Tucumán*, 1964, No. 15, pp. 108-9, from *Trop Abstr.*, 1965, **20**, Abstr. n1554.

In Tucumán, Argentina, traps baited with differen substances were placed in grapefruit trees. Both male and females of *Anastrepha* spp. and of *Ceratitis capita* were strongly attracted by wine vinegar, a concentratio of 25% being more attractive than 50%. Yeast extrac at concentrations of 1 and 2% was ineffective. Trime dlure attracted only *Ceratitis* males.

8712. Flanders, S. E., and Bartlett, B. R.
Observations on two parasites of citricola scale *Calif. Citrogr.* 1965, **50**: 320-3, bibl. 6, illus.

Metaphycus luteolus and *M. orientalis* parasitic o *Coccus pseudomagnoliarum*.

8713. Rosen, D., and Gerson, U.
Field studies of *Chilocorus bipustulatus* (L.) o citrus in Israel. [French summary ¼ p.] *A Épiphyt.*, 1965, **16**: 71-6, bibl. 12.

The population of this predator of citrus scale inse was found to be at its maximum during July. Its par in the control of scale insects is therefore considered t be more important than previously realized.—Hebre Univ., Rehovot.

8714. Orlando, A., Rodriguez, O., and Arruda H. V.
Estudos sôbre a eventual fitotoxicidade de óleos em plantas cítricas. **(Studies on the possibl phytotoxicity of oils to citrus.)** [English sum mary ¼ p.] *Biológico*, 1965, **31**: 71-7, bibl. 8.

The effects of 3 proprietary mineral oils recommende for the control of scales were investigated in trials o orange and tangerine. There was no leaf injury, bu spots or burns were observed near the tip of the fruit where spray drops had collected. The damage wa commoner with Everest and Citrex N oils than wit Citromulsion.

8715. Gaprindašvili, N. K., Isarlišvili, S. Ja., an Mosulišvili, N. M.
A biological method of controlling citrus white fl with the aid of the fungus *Aschersonia aleurodi* Webber. [Russian.] *Agrobiologija*, 1965, No. 2 pp. 255-61.

A spore/mycelial suspension of *A. aleurodis* sprayed o citrus trees in the autumn at 160 g. fungus/1,000 l./ha overwintered well and gave up to 88% control of whit fly larvae in the following year. Bordeaux, TMTD an calcium polysulphide killed the fungus in 3–5 days, bu had little effect after the development of the pustules Rogor, parathion with mineral oil emulsion an Kelthane did not kill the fungus.

Citrus—growth and reproduction.

716. Ahmed, S., and Khan, M. L.
Effect of gibberellic acid on the growth of citrus seedlings. *Punjab Fruit J.*, 1962-1964, **26/27**: 342-6, bibl. 9, illus.

ight-month-old rough lemon seedlings were sprayed ith 10–200 p.p.m. GA solutions 4 times at fortnightly tervals beginning in early May. A fortnight after the ıal treatment the plants sprayed with the 100 p.p.m. lution showed the greatest height increase, viz. 35·3 n. (200%) compared with 7·1 (40%) in the control, ıt growth was somewhat spindly with all concentra- ons and the leaves were pale green. Height increase as due to cell elongation, not to cell division. Con- ntrations of 25 and 10 p.p.m. gave the greatest girth pansion. All concentrations reduced leaf size.

717. Ahmed, S.
Relation of growth to fruitfulness in grapefruit. *Punjab Fruit J.*, 1962-1964, **26/27**: 178-97, bibl. 11.

study on Marsh Seedless grapefruit at Lyallpur ıowed that there were 4 growth flushes a year, begin- ng in March, June, July and November. The follow- g were among the conclusions: In all flushes terminal ıoots made more extension growth and, with the ception of the June flush, carried a greater area of leaf. he relative importance of the flushes with regard to tension growth and leaf area was in descending order: arch-June-July-December. Flowering was in direct oportion to extension growth. Shoots of medium size ıd vigour were more fruitful than weakly or highly getative shoots, the latter being barren. The rlier flushes were comparatively more fruitful than e later ones. Terminal branches were more apt to ›wer than laterals. Mean shoot length, mean leaf size ıd leaf area per shoot were greater in flowering than in ›n-flowering shoots in all flushes, except the July flush. ore laterals were produced in the earlier than in the ter flushes, and by terminal than by lateral shoots.

18. Owada, A., and Iwasaki, T.
Effects of MH sprays and other growth regulators applied in winter and the following early spring on the flower and shoot development of citrus trees. [Japanese, with English summary 1 p.] *Bull. hort. Res. Stat. Shizuoka, Ser. B* (*Okitsu*), 1965, No. 4, pp. 1-16, bibl. 28, illus.

x years' trials are reported on the effects of winter and ring applications of MH, 2,4,5-TP, gibberellin and netin on the flowering and shoot growth of Satsuma andarin and Washington Navel orange trees. Appli- tions in early March of MH at 300 and 600 p.p.m. nsiderably reduced flower production in young tsuma trees and stimulated shoot growth. Later and avier applications inhibited shoot growth. These ects were not obtained with adult Satsuma trees or th Washington Navels. Damage caused by MH ray at 1,200 p.p.m. is described. Gibberellin at 50 d 500 p.p.m. applied at the end of February or the ginning of April stimulated shoot growth in young tsuma trees but did not affect flower production. inter applications of 2,4,5-TP and kinetin did not ect either flower or shoot development.

19. Ahmed, S.
The time of fruit bud formation in grapefruit. *Punjab Fruit J.*, 1962-1964, **26/27**: 198-203, bibl. 11, illus.

studies on Marsh Seedless grapefruit at Lyallpur blossom bud differentiation took place in spring simultaneously with the initiation of new growth, the active period being the latter half of February. The percentage of blossom buds was slightly higher in the early than in the later flushes, and with terminal than with lateral buds.

8720. Khan, D. A.
Germination trials on mandarin pollens. *Punjab Fruit J.*, 1962-1964, **26/27**: 217-20, bibl. 5, illus.

In trials with glucose or sucrose solutions, using pollen of 8 varieties, the best result was given by 5–10% glucose solutions plus 0·1% bacto agar.

8721. Khan, M.-u.-D., and Chaudhri, M. K. H.
Pollination studies in *Citrus sinensis* L. *Punjab Fruit J.*, 1962-1964, **26/27**: 208-12, bibl. 8.

In investigations on 5 varieties the highest fruit set was obtained with natural pollination and supplementary selfing. Cross-pollination gave poor fruit set; natural and artificial selfing gave similar results. Sweet orange proved to be self-pollinating; and insects were the most important natural pollinating agents.

8722. Hensz, R. A.
A morphological and physiological investigation of the self-incompatibility of the Orlando tangelo. *Diss. Abstr.*, 1964, **25**: 3178, being *Order No.* 64-11,535 of 93 pp.

Both Orlando and Duncan pollen germinated on Orlando stigmas and both produced pollen tubes which grew to the base of the styles and penetrated the upper ovary. Here, however, the Orlando pollen tube growth was inhibited, whereas Duncan pollen tubes penetrated the embryo sacs and effected fertilization. A growth substance named promoter II, having an Rf value similar to that of IAA, was isolated from extracts of styles and ovaries. The production of promoter II in the Orlando pistil was stimulated by the presence of pollen tubes. It is suggested that parthenocarpic fruit set in Orlando is controlled by endogenous concentrations of promoter II and that greater fruit set following cross-pollination is due to the increased production of promoter II associated with endosperm development. None of the growth substances extracted was considered responsible for self-incompatibility.—Univ. Fla.

8723. Soost, R. K.
Use of pollen dispensers in citrus. *Calif. Citrogr.*, 1965, **50**: 247-9, bibl. 5.

A discussion. [See also *H.A.*, 34: 1487.]

8724. Krezdorn, A. H.
Unfruitfulness in commercial citrus varieties. *Punjab Fruit J.*, 1962-1964, **26/27**: 204-7, bibl. 20.

Causes and correction, in the U.S.A., by cross-pollination, girdling or ringing, growth substances and strain selection.

8725. Ahmed, S., and Shah, J. A.
Some studies on the effect of pruning upon the initiation of flowers, fruit set and fruit drop in sweet lime. *Punjab Fruit J.*, 1962-1964, **26/27**: 134-7, bibl. 15.

In a trial at Lyallpur there were 3 pruning treatments consisting of the removal of 1, 2 or 3 of every 5 shoots. Increasing intensity of pruning progressively reduced the total number of flowers per tree and the total and percentage flower drop, and progressively increased the percentage fruit set and number of fruits per tree.

8726. Hield, H. Z., Coggins, C. W., Jr., and Garber, M. J.
Effect of gibberellin sprays on fruit set of Washington Navel orange trees. *Hilgardia*, 1965, **36**: 297-311, bibl. 16.

During 1958-61 entire trees were sprayed during flowering and early fruit set with KGA in concentrations ranging from 12·5–184 p.p.m. In most cases the fruit yield decreased; twig dieback and leaf drop were observed and correlated with a reduction in fruit set. KGA delayed the development of rind colour and in some of the higher concentrations caused an increase in rind thickness. During one season the treatments were associated with an increase in split fruit. [See also *H.A.*, 33: 5989, 35: 1865 and 4402.]—Univ. Calif., Riverside.

8727. Lewis, L. N., Khalifah, R. A., and Coggins, C. W., Jr.
Seasonal changes in citrus auxin and 2 auxin antagonists as related to fruit development. *Plant Physiol.*, 1965, **40**: 500-5, bibl. 25.

Fruit set in the parthenocarpic Navel orange was correlated with a high level of citrus auxin typical of the pattern shown for grapes. The period of maximum fruit drop appeared to coincide with the change from cell division to cell enlargement, a change in the pattern of auxin accumulation, and the initial detection of an auxin antagonist, inhibitor I. The highest concentration of inhibitor I was associated with a change in the growth rate of the fruit and a decrease in auxin level. [See also *H A.*, 35: 4363, 6537.]—Univ. Calif., Riverside.

8728. Ahmed, S., and Mazhar, H.
Effect of growth regulating substances on the premature and preharvest drop of Jaffa orange and Feutrell's Early mandarin. *Punjab Fruit J.*, 1962-1964: **26/27**: 347-55, bibl. 12.

Six-year-old trees were sprayed at the end of May and the end of September with 7 different materials, viz. NAA, 2,4-D, IAA, 2,4,5-T, sucrose, Perenox and GA at several rates. With Feutrell's Early mandarin the best control of both premature drop, i.e. fruit shed before the second spray, and pre-harvest drop was obtained with NAA at 10 p.p.m. and 2,4-D at 10 p.p.m. With Jaffa orange the most effective treatments were NAA at 15 and 20 p.p.m. and 2,4-D at 10 p.p.m.

8729. Ali, N., and Rashid, A.
Studies on the control of preharvest drop of Kinnow mandarin by the use of growth regulating substances. *Punjab Fruit J.*, 1962-1964, **26/27**: 335-41, bibl. 11.

Solutions of NAA, 2,4-D and Perenox at different concentrations were applied at 4 gal. per tree, 2, 3 or 6 months before harvesting. The best results were obtained with application 2 months before harvesting, viz. 70–86% reduction in drop with 2,4-D at 10–20 p.p.m., and 88 and 64% with NAA at 15 and 20 p.p.m. Perenox at 2 lb./100 gal. (the only rate tested) reduced drop by 57%.

Citrus—fruit physiology, quality and composition.

(*See also* 7254.)

8730. Kordan, H. A.
Some morphological and physiological relationships of lemon fruit tissue in vivo and in vitro. *Bull. Torrey bot. Cl.*, 1965, **92**: 209-16, bibl. 13, illus.

Although morphologically a single unit, the sac an stalk of the mature juice vesicle of Eureka lemon frui showed distinct differences in vascularization and in ce vacuolar contents, the cell sap from the sac being sign ficantly more acid than that from the stalk. Evidence presented which indicates that this difference in citri acid accumulation has a direct effect upon the growt potentialities of the sac and stalk *in vitro*, the stal producing callus growth, the sac not doing so under th same conditions. [From author's summary. See als *H.A.*, 35: 1867.]—Univ. Calif., Los Angeles.

8731. Bogin, E., and Erickson, L. C.
Activity of mitochondrial preparations obtaine from Faris sweet lemon fruit. *Plant Physiol* 1965, **40**: 566-9, bibl. 8.

The procedure described for obtaining active mitc chondrial preparations from sweet lemon peel was als suitable for use with sour varieties. Citric acid occurre in sweet lemon at a lower concentration than malic aci Oxidative phosphorylation was obtained with citrat α-ketoglutarate, succinate and malate as substrates and pyruvate produced citrate, α-ketoglutarate an malate.—Univ. Calif., Riverside.

8732. Maxie, E. C., and others.
Effect of gamma radiation on rate of ethylene an carbon dioxide evolution by lemon fruit. *Pla Physiol.*, 1965, **40**: 407-9, bibl. 12.

A full account of work abstracted in *H.A.*, 35: 4369.

8733. Monselise, S. P., and Goren, R.
Changes in composition and enzymatic activity i flavedo of Shamouti oranges during the colo break period, as influenced by application c gibberellin and 2-chloroethyl trimethylammoniu chloride. *Phyton, Argentina*, 1965, **22**: 61-6, bib 13.

Shamouti orange fruits still green but near maturit were sprayed with GA, CCC or left unsprayed as con trol. Periodically, during the normal period of chang in colour, the flavedo was analysed for ascorbic aci hesperidin, reducing sugar and N and the followin enzymatic activities: peroxidase, catalase and indole acetic acid degradation. Changes found were due bot to seasonal trends and to growth regulators. Dr weight and ascorbic acid increased, reducing sugar attained a peak and decreased thereafter. Hesperidi and catalase activity decreased during the whole perio Peroxidase and indoleacetic oxidase fluctuated. (A these were calculated on N basis.) Nitrogen on dr weight basis decreased during the whole perio Gibberellin-treated fruit grew largest in size; thei degreening and the process of peroxidase decreas toward the end of the period were delayed, probabl because of delayed maturity of peel. The size of fruit sprayed with CCC was much reduced. [Authors abstract. See also *H.A.*, 35: 1862.]—Hebrew Univ Rehovot.

8734. Khalifah, R. A., Lewis, L. N., and Coggins C. W., Jr.
Isolation and properties of gibberellin-like sub stances from citrus fruits. *Plant Physiol.*, 1965 **40**: 441-5, bibl. 11, illus.

Three different gibberellin-like substances were isolate from the fruits of Washington Navel oranges an Eureka lemons. Column chromatography, pape chromatography, thin-layer chromatography, fluoro metric properties and biological assay of the 3 com unds have been determined. Two of these sub- nces were found to be similar to gibberellins 1 and 9. e third compound was not similar to any of the 9 own gibberellins. [From authors' summary.]—niv. Calif., Riverside.

35. FLETCHER, W. A., AND HOLLIES, M.
Maturity and quality in New Zealand oranges evaluated. *N.Z. J. Agric.*, 1965, **110**: 153-60, bibl. 3, illus.

ta are presented from 10 years' studies on the effects variety, rootstock, district and time of harvesting on composition of New Zealand oranges. Minimum nposition and quality standards are suggested. [See o *H.A.*, 35: 1866.]—D.S.I.R., Auckland.

36. AHMED, S., AND KHAN, M.-U.-D.
Quality of grapefruit as affected by aspect and height. *Punjab Fruit J.*, 1962-1964, **26/27**: 411-18, bibl. 4.

an investigation on Marsh Seedless grapefruit at allpur fruits borne on the eastern side of the tree were ger and heavier than those on the western side, ving more juice with a better sugar-acid ratio and less and peel. Fruit on the south-west was poorest in ality. Fruit borne on the upper part of the tree was avier and juicier than fruit on the lower half.

37. AZIM, M. A., AND BUTT, B.
Effect of ripening and storage in oranges. *Punjab Fruit J.*, 1962-1964, **26/27**: 419-23, bibl. 15.

ta on extractable juice, vitamin C, reducing sugars, tic substances, ash, acidity, protein, Ca, Fe and P in eapple orange during ripening.

38. BASKER, H. B.
Ash and phosphorus content of citrus juices produced in Israel. *Israel J. Technol.*, 1964, **2**: 325-7, bibl. 13.

eat variations in the ash and P contents of samples of nge, lemon and grapefruit juices indicated that the asurement of such contents could not be used for detection of adulteration, except in extreme cases—verman Citrus Prod. Res. Lab., Rehovot.

39. SWIFT, L. J.
Proximate analyses of Florida orange peel juice extract for the 1962-63 and 1963-64 seasons. *J. agric. Food Chem.*, 1965, **13**: 282-4, bibl. 4.

ce was obtained from whole orange peel with a draulic press at intervals during the 1962-63 and 3-64 seasons. In general, maturity and variety did appear to have much influence on peel juice erness except in the last sample of the season when erness was greater. The quantity of benzene racted was considerably higher during the 1963-64 son. There appeared to be some agreement between l juice bitterness and the content of extract neutral ction. From threshold flavour values, the neutral ction was estimated to be responsible for 35 to 75% the total bitterness. [From author's abstract.]— . Fruit Veg. Prods Lab., Winter Haven, Fla.

0. NEWHALL, W. F., AND TING, S. V.
Isolation and identification of α-tocopherol, a vitamin E factor, from orange flavedo. *J. agric. Food. Chem.*, 1965, **13**: 281-2, bibl. 10.

method described.

1. MONSELISE, J. J.
A rapid method for the determination of acidity and aldehyde percent in citrus essential oils. *Israel J. Technol.*, 1964, **2**: 351.

The method involves 10 seconds of centrifuging and 2 simple titrations. [For related work see *H.A.*, 33: 1647.]—Assis Labs, Ramat Gan.

8742. HENDRICKSON, R., AND KESTERSON, J. W.
Seed oils from *Citrus sinensis*. *J. Amer. Oil Chem. Soc.*, 1963, **40**: 746-7, from *Analyt. Abstr.*, 1965, **12**: Abstr. 1410.

Iodine values and refractive indices are tabulated for oils from the seeds of 4 varieties of orange, ranges of variation being indicated for one. The graph of iodine values versus refractive index is approx. rectilinear for orange, grapefruit, tangerine and lemon seed oils. Also tabulated are quantitative fatty acid compositions of seed oils from 5 varieties of orange, one of tangerine and 2 of lemon. Orange seed oil content could be correlated with maturity as defined by the ratio of total solids to acid content.

Citrus—harvesting, handling and by-products.

8743. MCCARTY, C. D., KEMPER, W. C., AND LEWIS L. N.
Leaf and twig removal as related to mechanical harvesting of oranges. *Calif. Citrogr.*, 1965, **50**: 208.

In the experiment here described 100%, 50% or 25% of the leaves or 6–8 in. of stem per fruit were removed with each fruit from Washington Navel orange trees. Completely defoliated trees produced a new growth flush immediately but the new leaves were smaller than those of the controls and deficiencies in trace elements, particularly Zn, were more noticeable. Similar effects, but to a lesser degree, were observed on 50%-defoliated trees. Trees on which 25% of the leaves or 6–8 in. of the stem per fruit were removed did not apparently differ from the controls. Limited data showed a trend towards lower yields with increasing defoliation and stem removal. Greater fruit size associated with lower yields did not offset fruit loss. No significant differences were found in the soluble solids and acids contents or the soluble solids : acids ratio of treated and control fruits.—Univ. Calif., Riverside.

8744. PACETTO, M., AND SALERNO, M.
Possibilità pratiche di lotta contro i marciumi dei frutti di limone. **(Practical possibilities of controlling lemon fruit rots.)** *Inf. fitopat.*, 1965, **15**: 158-9, illus.

A short version of the article abstracted in *H.A.*, 35: 6550.

8745. SMOOT, J. J., AND MELVIN, C. F.
Reduction of citrus decay by hot-water treatment. *Plant Dis. Reptr*, 1965, **49**: 463-7, bibl. 10, illus.

Immersion in hot water at 128° F. for 5 minutes effectively reduced post-harvest decay of natural coloured oranges, but did not reduce decay of Hamlin oranges that required ethylene degreening treatment and that were harvested early in the season. Decay of both ethylene treated and untreated tangerines was effectively reduced, but physiological rind breakdown was increased. Hot-water treatment reduced the incidence of decay of oranges and tangerines as much as or more than the fungicide sodium *o*-phenylphenate. Decay of grapefruit at 3 different maturities was not consistently reduced by hot-water treatment. [From authors' summary. See also *H.A.*, 34: 5635.]—U.S. Dep. Agric., Orlando, Fla.

8746. Harding, P. R., and Savage, D. C.
Use of foam washers for treating poststorage lemons with sodium orthophenylphenate. *Plant Dis. Reptr*, 1965, **49**: 332-4, bibl. 5.

Decay was considerably reduced when fruit, deliberately damaged and inoculated with diphenyl-sensitive strains of *Penicillium digitatum*, was washed with sodium *o*-phenylphenate tetrahydrate prior to waxing and packing. When such washing was combined with the use of diphenyl-impregnated paper sheets in the cartons the 2 treatments were found to be complementary in effect. The use of sodium *o*-phenylphenate did not cause any significant amount of rind burn; 2% of the tetrahydrate applied at pH 11·3–12 was effective and safe in the type of foam washer used. [For earlier work see *H.A.*, 34: 3642.]—Sunkist Growers Inc., Ontario, Calif.

8747. Leggo, D., and Seberry, J. A.
The effect of diphenyl wraps and case liners on green mould wastage in stored oranges. *Aust. J. exp. Agric. Anim. Husb.*, 1965, **5**(16): 91-6, bibl. 10.

Diphenyl wraps and diphenyl liners in combination with sodium *o*-phenylphenate and borax-boric acid dips were compared for control of green mould on Washington Navel and Valencia oranges. Treatment of the fruit with sodium *o*-phenylphenate, combined with the application of diphenyl, whether impregnated in fruit wrappers or case liners, effectively reduced green mould in oranges stored at atmospheric temperatures for periods of up to 9 weeks. There were indications that the location of the diphenyl-impregnated case liners within the container is an important factor in the efficiency of mould control by these treatments. [From authors' summary.]—Citrus Wastage Res. Lab., Gosford, N.S.W.

8748. Sperlich, E.
Detection of diphenyl, *o*-phenylphenol and thiourea in citrus fruits. [German.] *Z. Lebensmitt-Untersuch.*, 1963, **123**: 269-78, from *Analyt. Abstr.*, 1965, **12**, Abstr. 1417.

In the oily matter extracted from the outer peel.

8749. Souci, S. W., and Maier-Haarländer, G.
Investigations on the analysis of diphenyl. I. [German.] *Z. LebensmittUntersuch.*, 1963, **119**: 217-22, from *Analyt. Abstr.*, 1965, **12**, Abstr. 3033.

Modified procedure for determination in citrus fruits based on that of Gunther [*H.A.*, 33: 3875]. [For part II see *H.A.*, 35: 1916.]

8750. Vogel, J., and Deshusses, J.
Detection and determination of diphenyl in [citrus] fruits by gas chromatography. [French.] *Mitt. Lebensm. Hyg., Bern*, 1964, **55**(2): 84-92, from *Analyt. Abstr.*, 1965, **12**, Abstr. 3535.

Outline of the method.

8751. Hendrickson, R., and Kesterson, J. W.
Citrus molasses. *Tech. Bull. Fla agric. Exp. Stats* **677**, 1964, pp. 27, bibl. 37, illus.

Processing techniques and analyses, production problems and utilization.

8752. Maymone, B., and Dattilo, M.
Digeribilità e valore alimentare dei sottoprodo della industria agrumaria italiana nella aliment zione animale. (**The digestibility and nutrition value of by-products of the Italian citrus indust for animal feeding.**) [English summary 1½ pp *Ann. Sper. agrar., Roma*, 1962 [issued 1965], 1 245-74, bibl. 38, illus.

Composition figures are given for the fruit residues aft juice extraction from sweet oranges, bergamot orang and lemons. The whole residues proved very sati factory for animal feeding, but depectinized lem residue was deficient in nutritive value—Ist. spe zootec., Roma.

Dates.

8753. Ahmed, S. (Editor).
Date Palm Number. *Punjab Fruit J.*, 1962, 2 1-116, bibls, illus., [received 1965].

This special number contains articles on date culture general, date garden management, cultivation in Sin Kalat and Dera Ismail Khan, a comprehensive accou of production and marketing in Iraq, advice on growi and handling off-shoots and one paper each on pes and diseases. A summary is included of a date surve in the Muzaffargarh district in 1962-63. Papers on th effects of different pollens on fruit quality and maturit and studies on some distinguishing characters of Ira date varieties have been abstracted separately. [Fo papers were previously abstracted, see *H.A.*, 33: 605 8040, 8041, 8051.]

8754. Ahmed, S., and Ahmad, W.
Studies on some distinguished characters of Ira dates at Jhang. *Punjab Fruit J.*, 1962, **25**: 83-9 bibl. 8, [received 1965].

The mean values of data collected in 1961-1962 a presented as 10 tables. They relate to stem girth, heig foliage, sucker production, flowers and fruit of 1 varieties. Recommended varieties for local cultivati are Hillawi, Khudrawi, Mekran, Zahidi and Shamra —Ayub agric. Res. Inst., Lyallpur.

8755. Elmer, H. S.
Banks grass mite, *Oligonychus pratensis*, on dat in California. *J. econ. Ent.*, 1965, **58**: 531– bibl. 7, illus.

The distribution of the pest and the damage caused a discussed. Although sulphur dust when appli correctly reduces mite injury, carbophenothion, tetr difon and Kelthane used as dusts or sprays gave com parable results. Sulphur used as a spray on dates ha some practical advantages over conventional sulph dusting. [From author's abstract.]—Univ. Cali Riverside.

8756. Ahmed, S., Ali, N., and Mazhar, H.
Effect of pollens of different *Phoenix* species on t quality and maturity of Hillawi variety of da palm. *Punjab Fruit J.*, 1962, **25**: 72-82, bibl. 1 illus., [received 1965].

The male parent palms employed in the study we *P. dactylifera*, *P. sylvestris*, *P. canariensis* and *P. humil* Tabulated results are presented concerning infloresce characters, fruit set and the growth rate, and physic and chemical characteristics of the fruit. The on significant differences noted were in the fruit deriv from *P. humilis* pollen. It was the smallest in size a weight, matured earliest because of the rapid develo nt of total sugars, and contained more reducing and n-reducing sugars. There were no marked differ- ces in the fruit set and moisture content percentages.

57. Heftmann, E., Ko, S.-T., and Bennett, R. D.
Identification of estrone in date seeds by thin-layer chromatography. *Naturwissenschaften*, 1965, **52**: 431-2, bibl. 8.

e kg. of date seeds was found to contain 1·9 mg. trone.—U.S. Dep. Agric., Albany, Calif.

58. Akher, M. A., and others.
The chemical composition and utilization of palm tree leaves. *Alex. J. agric. Res.*, 1964, **12**: 179-89, bibl. 16, from *Trop. Abstr.*, 1965, **20**, Abstr. n1080.

enix dactylifera leaves, especially the petioles, are tively rich in cellulose fibres and in α- and β-cellulose ctions, and relatively poor in ash and pentosan.

Loquats.

(*See also* 7144.)

9. Rajput, C. B. S., and Singh, J. P.
Chemical analysis of loquat fruits. *Indian J. Hort.*, 1964, **21**: 204-5, bibl. 6.

9 varieties. [See also *H.A.*, 33: 1652.]

Macadamias.

0. Joubert, A. J., Bolt, L. C., and Van der Meulen, A.
Trials with the propagation of the macadamia. *Fmg S. Afr.*, 1965, **41**(2): 49-52, bibl. 11, illus.

3 years' budding trials all techniques yielded very or results, the overall success being only 4%. Of eral hundred hardwood cuttings placed under a mist pagator during the spring and autumn of one year, rox. 35% formed good roots and no trouble was erienced in establishing and hardening the rooted tings. All softwood cuttings died before roots e formed. Of 75 air-layers made one year, 32 ned good roots but the method was considered practical owing to difficulty in hardening rooted ers. Grafting proved the best of the propagation hods tested, the whip graft, which is described in ail, being superior to the whip-and-tongue and the -wedge.—Citrus subtrop. Fruit Res. Inst., Nelspruit.

1. (Leigh, D. S.)
Macadamia propagation. *Agric. Gaz. N.S.W.*, 1965, **76**: 242.

results of recent shade-house trials are briefly cribed. For successful grafting, late autumn and y spring were the best periods, and bark grafts were erior to side grafts. Scions with 2 bud whorls and g internodes were preferable, and surrounding the on with plastic film to avoid desiccation increased the nces of success.

2. Warner, R. M., and Awada, M.
Some growth and yield characteristics of Keauhou variety macadamia under different levels of irrigation. *A.R. north. Nut Grs' Ass., 1964*, pp. 36-41, bibl. 3.

vy irrigation during July-September significantly eased yields and the percentage of large nuts, but increased the percentage of sub-standard nuts taining less than 72% oil).—Univ. Hawaii.

Olives.

(*See also* 6982, 7075.)

8763. Rodríguez, J. F.
Procedimientos empleados en las nuevas plantaciones extensivas de olivos en Brasil. **(Procedures used in the new and extensive olive plantations in Brazil.)** *Bol. Oleic. int.*, 1965, No. 84/85, pp. 17-38.

Soils and their preparation, climate, varieties, propagation and nursery management, planting, and disease and pest control.

8764. Mazzocchi, G. B.
El cultivo del olivo en Libia. **(Olive growing in Libya.)** *Bol. Oleic. int.*, 1965, No. 84/85, pp. 7-15.

Regional surveys briefly describe environmental conditions and cultural practices, and list the varieties grown. Fruit characteristics are tabulated for 31 varieties grown in Tripolitania.

8765. Milella, A.
L'olivo in Sardegna. **(Olives in Sardinia.)** *Ital. agric.*, 1965, **102**: 515-25, bibl. 10, illus.

Conditions in Sardinia do not favour the increased cultivation of olives for oil extraction, but promising results have been obtained with new systems of training for table olives.

8766. Hartmann, H. T., and Hackett, W. P.
Algunos efectos del enfriamiento del invierno sobre la productividad de los olivos. **(Some effects of winter chilling on olive production.)** *Bol. Oleic. int.*, 1965, No. 84/85, pp. 49-53, bibl. 5.

A Spanish summary of papers abstracted in *H.A.*, 34: 1595, 7588.

8767. Ortega Nieto, J. M., Ferreira Llamas, J., and García-Delgado, F.
Estudio preliminar sobre el diagnóstico foliar en el olivo. **(A preliminary study on foliar diagnosis in olives.)** [*Publ.*] *Inst. nac. Invest. agron., Madrid*, 1964, pp. 11, bibl. 3, illus.

Analyses for N, P, K, ash and moisture were made in August on olive leaves from different parts of the crown of a mature tree. There were no significant differences in the composition of leaves from the north, south, east and west parts of the crown. Leaves from the upper part were richest in N and those from the interior contained more N than those from the middle exterior. Values of P and K were also lowest in this region, and highest in the interior. In general, the differences were small, but there was evidence that the fruiting branches were depleted of K.

8768. Gavalas, N. A., and Démétriadès, S. D.
Calcium distribution in relation to the chlorosis in boron deficient olive leaves. *Ann. Inst. phytopath. Benaki*, 1964, **7**: 37-45, bibl. 24, illus.

Determinations were made of B, Ca, Mg and K in the chlorotic and the green tissues of leaves from trees affected by B deficiency. The average ratio Ca in the green portion/Ca in the chlorotic portion was 2·48; the ratios for B, Mg and K were 1·54, 1·65 and 1·04, respectively. Except for K, the content of these elements was much less in chlorotic leaves than in green leaves of the same age from the same trees. A similar, uneven Ca distribution (ratio 3·26) was found in true Ca-deficient chlorotic leaves, whereas differences in B, Mg and K were less marked. It is suggested that the leaf chlorosis observed on B-deficient olive trees is due to induced Ca deficiency and only indirectly related to boron shortage.

8769. WILSON, E. E.
Differential retention of pathogenicity among isolates of *Pseudomonas savastanoi* from olive and oleander. Abstr. in *Phytopathology*, 1964, **54**: 912.

After 2 years in culture all oleander isolates retained their pathogenicity to olive, whereas most of the olive isolates lost their pathogenicity to oleander but retained their pathogenicity to olive. Evidence indicated that association with the olive host may reduce the ability of oleander isolates to reinfect the oleander, whereas association with the oleander hosts enhanced the ability of olive isolates to reinfect that host. Although the ability of olive isolates to initiate tumours in olive was related to their *in vitro* production of indole-3-acetic acid, the loss of the ability to initiate tumours in oleander was not accompanied by noticeable change in growth substance production.—Univ. Calif., Davis.

8770. LABORDA RODRÍGUEZ, E.
El captan en el control del "repilo" (*Cycloconium oleaginum* Cast.). **(Captan for the control of olive leaf spot, *Cycloconium oleaginum*.)** *An. Edafol. Agrobiol.*, 1965, **24**: 71-7, bibl. 2.

A single application of 0·2% captan in early April markedly reduced infection of olive leaves and raised the average yield per tree from 16 to 35 kg. Bordeaux at 1·5% was much less effective. The need for a second treatment before the autumn rains is indicated.

8771. KOUYEAS, V.
On the etiology of "gelatina", a disease causing decline of olive trees. *Ann. Inst. phytopath. Benaki*, 1964, **6**: 107-16, bibl. 17. illus.

A disease identical to the Italian "gelatina" is described, and attributed to root rot caused by *Omphalotus olearius* or possibly by a second unidentified basidiomycete. High soil moisture seems to be a factor necessary for the development of the disease. A hypothesis on the transmission of *O. olearius* to olive is based on field observations. [Author's summary.]

8772. GRANITI, A.
Osservazioni su *Spilocaea oleagina* (Cast.) Hugh' III. Struttura submicroscopica della parete epidermica fogliare dell'olivo sana e invasa dal fungo. **(Observations on *Spilocaea oleagina*. III. The sub-microscopic structure of leaf epidermis cell walls of healthy and diseased olive trees.)** [English and French summaries ⅓ p. each.] *Phytopath. medit.*, 1965, **4**: 38-47, bibl. 35, illus.

8773. RUSSO, G.
Difesa dell'olivo dagli insetti dannosi. **(The protection of olive trees from harmful insects.)** *Progr. agric., Bologna*, 1965, **11**: 625-36, illus.

Liothrips oleae, associated with the beetle *Phleotribus scarabaeoides*, is controlled by applications, mainly in the summer, of lime-sulphur, barium polysulphide or nicotine products. Synthetic organic insecticides should be avoided as they adversely affect the biological balance. Black scale (*Saissetia oleae*) is controlled by spring applications of light oil, lime-sulphur or barium polysulphide, and by autumn and winter treatments with parathion in oil, followed by bordeaux mixture 3–4 weeks later. Similar measures are advised against *Pollinia pollini* and *Philippia oleae*. The larvae of the moth *Prays oleellus* are widely parasitized by *Agenias* *fusicollis* f. *praysincola*. Chemical control is effected lead arsenate applied after, and if necessary also befo fruit set. Phosphoric esters can safely be used autumn for the combined control of this pest a *Dacus oleae*. Leopard moths (*Zeuzera pyrina*) apples and pears, as well as olives, are controlled summer application of a mixture of DDT and pa thion. Bundles of branches and twigs can be left und the trees in early summer to attract ovipositing fema and afterwards treated with chlorinated organic co pounds. *Phleotribus scarabaeoides* is controlled si larly. Lead arsenate is recommended for controlli green olive moths (*Margaronia unionalis*).

8774. RUSSO, G.
Esperimenti di lotta biologica contro la mos delle olive (*Dacus oleae*) e la mosca della fru (*Ceratitis capitata*) in Italia. **(Experiments Italy on the biological control of olive flies, *Dac* *oleae*, and fruit flies, *Ceratitis capitata*.)** [Engl summary 8 lines.] *Ann. Fac. Sci. agrar. Napo* 1959-1960, **25**: 33-42, bibl. 1, illus., [receiv 1965].

The indigenous parasites of olive flies are listed a tests on the liberation of artificially raised *Opius conco* and other *Opius* spp. are briefly reported. Attempts introduce various parasites of *Ceratitis capitata* in Italy have not succeeded. *Opius concolor* parasiti this pest in Morocco, but not in Italy, Sicily or Sardin

8775. YAMVRIAS, C.
Essais préliminaires d'une préparation bactérien à *Bacillus thuringiensis* Berliner, sur la lutte con les larves de la génération anthophage de teigne de l'olivier (*Prays oleae* Bernard). **(P liminary trials of a preparation of *Bacil* *thuringiensis* in the control of the anthophag generation of olive moth larvae, *Prays olea*** *Ann. Inst. phytopath. Benaki*, 1964, **6**: 37-43, bi 15, illus.

The preparation Bactospéine was employed as a 0·25 aqueous solution, and sprayed on 2 sets of trees, one full bloom and the other with most flowers not opened. In spite of heavy rain on the day after trea ment a mortality of 74·3% was recorded after 8 days larvae from the trees in full bloom. On the other set trees the corresponding figure was only 7·7%.

8776. ANON.
La cocciniglia gobba e il cotonello dell'oliv **(Black scale and psyllid pests of olives.)** *Prog* *agric., Bologna*, 1965, **11**: 653-4, illus.

Summer and autumn treatments with either organ phosphorus/oil mixtures or barium polysulphide a recommended for the control of *Saissetia olea* Moderate infestations of *Euphyllura olivina* can controlled by nicotine preparations, in oil if necessa but phosphoric esters should be used only in ve severe cases.

8777. GALIGANI, P. F., AND GELLINI, R.
Raccolta delle olive meccanica e chimic **(Mechanical and chemical harvesting of olive** *Progr. agric., Bologna*, 1965, **11**: 697-712, ill

The devices described for the mechanical harvesting olives include hand-operated combs and sweepers, a power-driven shakers and vacuum sweepers. F varieties with an extended period of fruit ripening single mechanical shaking was inadequate, and etition of the process was uneconomic. Preliminary s with pre-harvest sprays showed that 1% ascorbic l applied 6–8 days before shaking markedly increased percentage of olives released. The effect was ısmitted in considerable measure to untreated ıches. Other products which loosened the fruits e MH, IAA and a proprietary preparation known as nianca, but ascorbic acid would have the additional antages of increasing the vitamin C content of the t and of checking rancidity in the oil.

3. Morettini, A.
La raccolta meccanizzata delle olive. Aspetti agronomici fondamentali di fronte al problema economico. **(Mechanized olive harvesting. Fundamental agronomic aspects with regard to the economic problem.)** *Ital. agric.*, 1965, **102**: 492-503, bibl. 12, illus.

factors to be considered in deciding which, if any, hines and tools should be purchased for olive vesting.

9. Marsico, D. F.
Características analíticas de los aceites de oliva de la República Argentina en función de la región de cultivo y de la época de recolección. **(The analytical characteristics of Argentine olive oils as affected by locality and harvesting time.)** *Bol. Oleic. int.*, 1965, No. 83, pp. 9-21, bibl. 29.

ıt years' data are summarized. The Bellier index markedly higher than in European olive oils. The ne index was highest in regions with a warm mn climate and for early winter harvesting dates. as lower at the end than at the beginning of the esting period. Acidity was high in oils from ons subject to heavy rainfall or frost and in those ı early harvested fruits.

). Constanzo, N., and Zerbinato, E.
Sobre las características espectrofotométricas ultravioletas de los aceites de oliva argentinos. **(The characteristics of Argentine olive oils as shown by ultraviolet spectrophotometry.)** *Bol. Oleic. int.*, 1965, No. 83, pp. 23-8, bibl. 7.

quality of the oils from the 1963 harvest was below specified for "superfine" oils in Italy. Consider- regional variation was evident.

Passion fruit.

. Kuhne, F. A.
Tasty granadillas and their root systems. *Fmg S. Afr.*, 1965, 41(2): 33, 35, 37, illus.

ıdy of the root distribution of *Passiflora edulis* and *lulis* f. *flavicarpa* with tabulated data.

. Shigeyama, T., and Murakami, H.
On vitamin C in various organs of the passion fruit plant. [Japanese, with English summary 9 lines.] *Bull. Fac. Agric. Miyazaki*, 1963, **9**: 135-41, bibl. 17.

green parts of the plant had a very high content of nin C, but the content of the reduced form of nin C in the petals and juice was very low. Young s or leaves exposed to the sun were rich in the ced form. Old and shaded leaves contained large quantities of the oxidized form. *P. incarnata* contained less vitamin C than *P. laurifolia* and *P. edulis*, both of which contained about 1,000 mg. per cent.

8783. Doepel, R. F.
Brown spot of passion fruit. *J. Agric. W. Aust.*, 1965, **6**: 149-50, illus.

The symptoms of the disease caused by *Alternaria passiflorae* are described. Adequate pruning by removing all low hanging growth and thinning the laterals, and routine spraying with bordeaux at monthly intervals during spring and summer, and at 2 monthly intervals for the rest of the year, are recommended.

8784. Ishihata, K.
On the development of the fruit and behaviour of flower organs in purple passion fruit (*Passiflora edulis* Sims). *Mem. Fac. Agric. Kagoshima*, 1965, **5**(2): 1-7, bibl. 2, illus.

Morphological and anatomical studies are described. Curvature movements of the pistil and stamen appeared to be related to success in pollination. The development of the juice sac is illustrated.

Persimmons.

(*See also* 7144.)

8785. Wakisaka, I.
Ultra-low temperature storage of pollen of Japanese persimmons (*Diospyros kaki* Linn. f.). [Japanese, with English summary 7 lines.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 291-4, bibl. 10, illus.

Pollen stored in sealed ampules at −196° and −80° C. for one year had germination percentages of 41·8 and 42·7%, respectively. At high room temperatures after removal from storage the germination rate decreased rapidly, but pollen kept below 10° C. for 1 or 2 weeks germinated well. No differences were found in fruit set and development or in seed number between fruit derived from pollination using stored and freshly collected pollen.

8786. Kishimoto, O.
Factors affecting fruit weight of Japanese persimmons (*Diospyros kaki* Linn. f.). [Japanese, with English summary 17 lines.] *J. Jap. Soc. hort. Sci.*, 1964, **33**: 295-301, bibl. 25.

In 3 years' trials trees of 3 varieties were thinned to 1 fruit per bearing shoot in July of each year. Fruit number per metre length of shoot was used to indicate the fruit load per tree. A significant negative correlation was found between the fruit load per tree and the average weight of an individual fruit. Positive relationships were found only occasionally between the average individual fruit weight and either bearing shoot length or seed number per fruit. The average fruit weight varied from 150–250 g. in different trees in the same year and on the same tree from year to year, and the coefficient of variation for individual fruit weight was 7–15%, regardless of the fruit load.

8787. Row, L. R., Rao, C. S., and Ramaiah, T. S.
The occurrence of lupeol group of triterpenoids in *Diospyros* species. *Curr. Sci.*, 1964, **33**: 367-8, bibl. 14.

In *D. melanoxylon*, *D. discolor*, *D. peregrina*, *D. kaki* and *D. chloroxylon*.

Tung.

8788. Kilby, W. W., Shear, C. B., and van der Zwet, T.
Cultivation of tung for economic production, leaf spot reduction, spring frost protection. *Bull. Miss. agric. Exp. Stat.* **696**, 1964, pp. 15, bibl. 19, illus.

See *H.A.*, 35: 4435.

8789. van der Zwet, T.
Etiology and control of angular leaf spot of tung: primary infection by *Mycosphaerella aleuritidis*. Abstr. in *Phytopathology*, 1965, **55**: 502.

Leaves on orchard tung trees (*Aleurites fordii*) were misted 5 times at levels of 3, 9, or 15 ft. above the ground on the ventral, dorsal or both sides of the le with petroleum oil at 3-week intervals, starting s after the first leaves appeared. By mid-July number of spots on the leaves nearest the ground significantly lower on those leaves misted either on dorsal side or on both sides than on those miste the ventral side or the non-misted control leaves. the intermediate level the data followed an iden pattern, but the number of spots per leaf was lowe all treatments. Leaf spot was extremely light inconsistent at the highest tree level. At all tree le combined, 50% of the non-misted and ventrally mi leaves were infected (1·5 spots/leaf) compared with of those misted on the dorsal or on both leaf sides spots/leaf).—U.S. Dep. Agric., Bogalusa, La.

TROPICAL FRUIT AND PLANTATION CROPS.

Areca palms.

8790. Rao, K. S. N.
Fungicidal spraying in arecanut during the dry weather period. *Arecanut J.*, 1965, **16**(1): 10-11, bibl. 2.

The flowers tend to become infected with *Gloeosporium* sp. in the dry season, when fungicidal spraying against *Phytophthora arecae* is normally discontinued. Spraying the bunches in the dry season with 1% bordeaux or a mixture of bordeaux and BHC or endrex has resulted in significantly increased nut-set.—Central Arecanut Res. Stat., Vittal.

8791. Anon.
Arecanut: control of mites. *Indian Fmg*, 1965, **15**(2): 32.

In trials for the control of white (*Paratetranychus indicus*) and red mites Trithion and Tedion (at 1 and 2 c.c. per l.) and Akar-338 (at 0·1%) checked reinfestation for 10–15 days. Chlorocide (1 kg./400 l.) plus Folidol E605 or wettable sulphur (0·04% or 1·5%, respectively) is also recommended.

Bananas.

(*See also* 8859.)

8792. Anon.
Banana Congo está em cartaz. **(The Congo banana is in the picture.)** *Dirig. Rur.*, 1964, **3**(8): 16-18, from *Trop. Abstr.*, 1965, **20**, Abstr. n1101.

Advantages and disadvantages of the Congo banana which is beginning to compete commercially with Dwarf Cavendish in São Paulo.

8793. Monnet, J., and Charpentier, J.-M.
Le diamètre des racines adventives primaires des bananiers en fonction de leur degré de polyploïdie· **(Diameter of the primary adventitious roots of the banana plant in relation to its degree of polyploidy.)** [English summary 5 lines.] *Rap. annu. Inst. franç. Rech. fruit. Outre-Mer, 1963-64*, reprinted in *Fruits d'Outre Mer*, 1965, **20**: 171-3.

A study of the roots of banana species and varieties in 1963 showed that those of triploids are in general much larger in diameter (6·20–8·50 mm. mean diameter) than those of diploids (mostly between 5·10 and 5·72 mm.). The corresponding figure for tetraploids was 7·35 mm. Ecological factors also affected root diameter.—Stat. Cult. fruit., Azaguié, Ivory Coast.

8794. Servicio Shell para el Agricultor.
Condiciones del suelo para el cultivo de c bures. **(Soil conditions for banana growi** *Not. agríc. Serv. Shell Agric., Venezuela*, 1 **4**: 44, illus.

8795. Martin-Prével, P., and others.
Essais sol-plante sur bananiers. Une méth d'étude de la fertilité. **(Soil-plant experi on bananas. A method of studying ferti** [English, German, Spanish and Russian s maries 16-18 lines each.] *Fruits d'Outre* 1965, **20**: 157-69, bibl. 9, illus.

With a view to studying the mineral nutrition o banana plant in relation to its development and to and climatic conditions 6 experiments laid dow 1960 are being carried out on Grande Naine Poyo bananas on volcanic soils in Martinique Guadeloupe. Periodical analyses have shown plants may suffer from K deficiency leading to quality on K-rich soils because absorption is contr by the proportion and not by the absolute quantity o exchangeable bases in the soil. Leaf chlorosis res bling Mg deficiency symptoms and "blue" disease not appear when the K/Mg ratio exceeded 0·25 (a earlier African studies), and plants grew well with showing important deficiency symptoms even when K/Mg ratio exceeded 1·0. Evidence suggests that disease is not a simple K/Mg disequilibrium but tha plays a part. [See also *H.A.*, 33: 8093.]

8796. Nambiar, P. K. D., and Nair, C. K. N.
Investigations on the possible relationship betw the nutritional status of soils and the incidenc "bunchy top" disease of bananas (*Musa* *Agric. Res. J. Kerala*, 1965, **3**: 78-99, bibl. illus.

Healthy and diseased leaves, and soil samples ta from beneath healthy and diseased plants were anal for N, P, K, Ca and Mg. Soils from infected a were generally more acid, contained more org material, N and available P, and less K, Ca and m less Mg than healthy soils. Diseased leaves conta more N, P, K and less Ca and Mg than healthy lea In a fertilizer experiment NPK, NPK+Ca, NPK+ and NPK+Ca+Mg treatments were applied to grown suckers which were infected by aphid tr mission. The appearance of the disease considerably delayed in plants receiving NPK+ and NPK+Ca+Mg.—Agric. Coll. Res. I Vellayani.

7. ROTH, G.
A new leaf-spot disease of Dwarf Cavendish banana in South Africa. [Afrikaans and French summaries ¼ p. each.] *S. Afr. J. agric. Sci.*, 1965, **8**: 87-92, bibl. 16, illus.

e symptoms are described: the cause is probably a nplex of at least 4 fungi (*Helminthosporium* sp., *ightoniella torulosa*, *Cordana musae* and *Glomerella gulata*) and 2 bacteria. Saprophytic organisms are o present. Poor soil and growing conditions may der the plants more susceptible to infection.

8. THAKUR, D. P., AND MISRA, A. P.
Incidence of anthracnose of banana in relation to weather conditions in Bihar. *Indian J. Hort.*, 1964, **21**: 249-51, bibl. 6.

investigations on table varieties at 3 stations banana hracnose (*Gloeosporium musarum*) was most prevat and severe in the hot, wet months of June-Septem-, and appeared to be arrested during the cold months December-February and the hot, dry months of rch-May.—Bihar agric. Coll., Sabour.

9. DAMODAREN, S.
Some observations on the control of anthracnose of banana. *S. Indian Hort.*, 1964, **12**: 64-7, bibl. 6, illus.

trials for the control of *Gloeosporium musarum* 1% deaux, Mycostatin (nystatin) at 100 p.p.m. and % Griseofulvin were all effective when applied as tective sprays, but none of the 15 compounds tested successful in eradicating the disease. The infective iods of the fruits of 4 varieties are tabulated, resiste being attributed to increases in the tannin content. e also *H.A.*, 35: 4453.]

0. MACE, M. E.
Peroxidases and their relation to vascular browning in banana roots. *Phytopathology*, 1964, **54**: 1033-4, bibl. 9.

e ability of both banana root and *Fusarium* peroxies to catalyse the oxidation of dopamine indicated t these enzymes, along with root polyphenoloxidase cytochrome c-oxidase and *Fusarium* laccase, may ticipate in the *in vivo* oxidation of dopamine to duce vascular browning. [See also *H.A.*, 35: 4452.] United Fruit Co., Norwood, Mass.

1. MEREDITH, D. S.
Tip rot of banana fruits in Jamaica. II. ***Verticillium theobromae*** **and** ***Fusarium*** **spp.** *Trans. Brit. mycol. Soc.*, 1965, **48**: 327-36, bibl. 31, illus.

veys in Jamaica failed to reveal the type of cigar-end ease in which *Verticillium theobromae* is the sole ociated fungus. All cigar-end specimens found e infected with both *V. theobromae* and *Deightoni- torulosa.* There was no evidence that *Verticillium* m tubes can penetrate the healthy and uninjured icle and epidermis cell wall of banana fruits. In the d typical cigar-end symptoms developed on some -scorched fruits which had been inoculated with idia of *V. theobromae*; unscorched inoculated fruits ained free from cigar-end. In the laboratory celial inoculum of *V. theobromae* caused slight decay ruits at 80° F. but little or no decay at 50–70°. The ction biology of *V. theobromae* is discussed. eral records of *Fusarium moniliforme* var. *subgluti- s* and other species of *Fusarium*, associated with er tip rot of bananas and plantains in Jamaica, are orted. [From author's abstract. For part I see ., 34: 5685.]—Banana Bd Res. Dep., Kingston.

8802. LARA E., F.
The banana stalk borer ***Castniomera humboldti*** **(Boisduval) in La Estrella Valley, Costa Rica. III. Rhythms and ecology.** *Turrialba*, 1965, **15**: 99-102, bibl. 7, illus.

The ant *Pheidole flavens* was found to be a predator of the borer larvae, and the presence of ants' nests at the bases of banana suckers prevented the borers from laying eggs.

8803. PAINE, R. W.
The banana scab moth, ***Nacoleia octasema*** **(Meyrick): its distribution, ecology, and control.** *Tech. Pap. S. Pacif. Commiss.* **145**, 1964, pp. 70, bibl. 42, illus.
Banana scab moth. *Pest Articles News Summ., Sect. A*, 1965, **11A**: 121-6, illus.

The life history and economic importance of the pest are described. Biological control has not been successful. The possibility of genetical control (promotion of interracial mating and irradiation of males) is briefly mentioned. A standard method of control is a DDT spray applied before the bracts open, followed by 2 dustings when the bunch is in the horizontal position. DDT combined with BHC dusts have been used where DDT alone was unsatisfactory, but this method is relatively costly.

8804. JOHNSON, J.
Relative toxicity of some synthetic organic insecticides to the banana aphid ***Pentalonia nigronervosa*** **Coq.** *Agric. Res. J. Kerala*, 1965, **3**: 55-7, bibl. 8.

In a laboratory study parathion was the most toxic insecticide, followed by endrin, dieldrin, DDT and aldrin, in that order.

8805. VENKATESAM, C., AND RANGACHARLU, V. S.
Studies on the pruning of "male bud" in banana. *Indian J. Hort.*, 1964, **21**: 232-4, bibl. 5.

When the bud was removed soon after the completion of bunch formation, leaving a 2-in. length of barren axis, the percentage increases in length and circumference of individual fruits at maturity were 29 and 50, the number of days from shooting to full maturity was 131 and the weight per bunch was 12·9 kg. When the bud was left in place the corresponding figures were 22%, 40%, 139 days and 12 kg. Other advantages of removing the buds are that they can be sold as a vegetable, and that the banana thrips (*Chaetanaphothrips orchidii*) is deprived of a living and breeding site.—Banana Res. Stat., Tanuku, A.P.

8806. GOTTREICH, M., BRADU, D., AND HALEVI, I.
A simplified method of estimating average finger weight in banana field experiments. *Israel J. agric. Res.*, 1965, **15**: 101-2, bibl. 1.

It is suggested that the weight of a representative fruit in a bunch, rather than the average fruit weight per bunch, be used as a basic datum for testing banana fruit development. Statistical analyses of field data [in a limited survey] showed the new method to be as accurate as the other, and to result in a considerable saving in time and labour. [Authors' summary.]—Volcani Inst. agric. Res. and Hebrew Univ., Rehovot, and Israel Banana Grs Org., Tel Aviv.

8807. YOUNG, R. E.
Extraction of enzymes from tannin-bearing tissue. *Arch. Biochem. Biophys.*, 1965, **111**: 174-80, bibl. 19.

A procedure is described for pre- and post-climacteric banana fruits, by means of which all cells of a tissue were ruptured to yield homogenates which could then be assayed for enzymes free of interference by tannins. —Univ. Calif., Los Angeles.

Cacao.

8808. Trinidad and Tobago Cocoa Board.
Administrative Report of the Affairs of the Cocoa Board for the year 1959, 1963, pp. 33, 60 cts.
Idem. 1960, 1963, pp. 32, 60 cts.
Idem. 1961, 1963, pp. 24, 50 cts.

Some details are given of experimental work in Appendices XIV (1959, pp. 28-33; 1960, pp. 29-32) and XI (1961, pp. 19-24). This includes breeding and selection; clonal, fertilizer, fungicide and variety trials; experiments on shade trees; and studies on cacao processing.

8809. West African Cocoa Research Institute (Nigeria).
Annual Report of the West African Cocoa Research Institute (Nigeria), 1963-64, [1965], pp. 110, bibls, illus., 5s.

Current investigations are reported under sectional headings, as follows: *F3 Amazon cocoa in Nigeria*, pp. 13-23: A review of parentage, multiplication and agronomic characteristics in relation to amelonado cacao. *Virus research*, pp. 23-47: The effects of alkaloids and pH on mechanical transmission; serological studies; rate of decay of virus in cold storage; virus tolerance field trials; selection and breeding for tolerance to swollen shoot; a summary of reactions of hybrid varieties to swollen shoot infection; partial rehabilitation of infected farms; virus/vector relationships; and the effect of light on the transmission of swollen shoot virus. *Black pod studies*, pp. 47-52: Search for resistance; and studies on the pathogen, *Phytophthora palmivora*. *Entomology*, pp. 53-72: Mirid studies and control; and studies on *Earias biplaga*, lepidopterous larvae and *Bathycoelia ovalis*. *Plant breeding and selection*, pp. 72-80: Progeny trials; selection of parents; genetical investigations; pod index studies; biclonal seed gardens; pollination studies; storage of budwood; and rooting of cuttings. *Agronomy*, pp. 80-102: Spacing and thinning trials; restriction of growth trial; nursery and establishment trials; chemical weedkillers; growth stimulants and retardants; pruning experiment; soil fertility; fertilizer trials; and cacao seed storage.

8810. Arana, O.
El cacao (*Theobroma cacao*), alimento precolombino. **(Cacao, a pre-Columbian food.)** *Agric. trop., Bogotá*, 1965, **21**: 179-82.

The subjects discussed include area cultivated in Colombia, number of trees, production, imports, number of persons employed in the industry, varieties (91·5% trinitarios and Amazonian forasteros), prices, diseases (*Monilia* pod rot is estimated to reduce production by 30–40%), and districts in which growing could be introduced in order to expand production and eliminate imports.

8811. Quansah, S. T.
Role of cocoa research in Ghana's economy. [French and Spanish summaries ¼ p. each.] *World Crops*, 1965, **17**(2): 40-3, bibl. 20, illus.

A review of the work being done on mirid contr control of swollen shoot and black pod diseases, min pests, the selection of improved varieties, physiologic and nutritional requirements, and by-products.

8812. Paéz B., G., and Siller, L.
The size of experimental cacao plots. *Caca Turrialba*, 1963, **8**(4): 11-12, [received 1965].

The coefficient of variation and the standard error of th difference of numbers of pods are tabulated for numb of trees per plot (1–36) and number of replicatio (144–4). Tentative recommendations are to use 8-tre plots with replication depending on the degree accuracy required.

8813. Ibáñez, M. L., and Casas, I. A.
The "pause" effect in cold death of cacao see [Spanish summary 10 lines.] *Turrialba*, 196 **15**: 140-1, bibl. 4, illus.

Cacao seeds chilled to 4° C. for 10 min. survived a germinated normally if immediately exposed to 37° f a further 10 min., but an interval of 5 or more mi between the cold and heat treatments resulted in th death of all the seeds, as did the omission of heat trea ment after chilling.—Inter-Amer. Inst. agric. Sc Turrialba, C.R.

8814. Ibáñez, M. L., and Casas, I. A.
The effect of phenol on respiration in cacao s cotyledon. [Spanish summary 14 line *Turrialba*, 1965, **15**: 59-61, bibl. 5.

Phenol caused a rise in the respiration rate of bo normal and cold-treated (seeds held at 4° C. for 30 mi cotyledons, especially the former. An explanation offered. [For earlier work see *H.A.*, 34: 3711.]

8815. Dubrovickaja, N. I., Furst, G. G., and Čalov T. A.
The biological characteristics of the cacao tree glasshouse culture. [Russian.] *Bjull. glav. b Sada*, 1964, No. 55, pp. 114-22, bibl. 17, illus.

Changes with age in some morphological and anat mical characters were studied in young cacao seedlin and in the shoots of bearing trees grown under glas Seedlings did not form lateral branches until they we 3 to 3½ years old, but cutting back the apex of 2-year-o plants induced the formation of lateral shoots from bu close to the place of wounding. Pruning in the wint activated the growth of only one bud, whereas prunin in the spring resulted in shoot growth from 2 bud Both the vegetative and generative buds were initiate in the cambial zone of the shoot.

8816. Rodríguez, R. M., and others.
Nutritional requirements of the cacao plant durin a yearly cycle. *Cacao, Turrialba*, 1963, **8**(4): 1- bibl. 23, [received 1965].

Trials on 3-year-old plants in solution culture in th greenhouse showed 2 peaks in the absorption of maj elements; these were related to flushes of growth. I the first (March-April) N, P, Ca and Mg were absorbe and in the second (September-October) N, P and C though less P and Ca than in the first. The initiati of anthesis coincided with a reduction in the amounts Ca, K and P absorbed, but Mg uptake reached a pea at this stage and large amounts of nitrate were absorbe During the formation of root apices in July P, Ca a Mg uptake increased, and nitrate and K were excrete Large amounts of P were absorbed during fruit ripenin "Negative absorption" appeared frequently during th second half of the cycle, particularly with K.

17. LOCKARD, R. G., AND BURRIDGE, J. C.
The levels of manganese, sodium, aluminium, iron, boron, zinc, and copper in the leaves of cacao (*Theobroma cacao* L.) as affected by shade, fertilizer, irrigation, and season. *Ann. Bot., Lond.*, 1965, **29**: 283-92, bibl. 31.

ne greatest variation in concentration of the elements
nder study was found to be due to the time of year at
hich the leaves were collected. The lowest concentra-
ons of Zn and Cu were found in the leaves collected
ring the peak of the main-season crop. The lowest
ncentrations of Mn, Al and Fe were found in leaves
llected about a month after the end of the main
rvest. The levels of most elements rose sharply
ter reaching a minimum, and the maximum levels
ere usually reached before completion of flowering for
e next main-season crop. The effects of the treat-
ents on the nutrient levels in the leaves were generally
nall. The fertilizer treatment [N, P, K and Mg]
nded to increase the levels of Mn, Al, Fe, Na and Zn,
d to decrease the level of B. The shade treatment
nded to increase the levels of Na, Cu and Zn, and to
crease the levels of Mn, Al and Fe. The irrigation
atment had no substantial effect on the level of any
ement. The levels of Fe, Mn and B were found to be
sitively correlated with the level of Al. [From
thors' abstract. See also *H.A.*, 35: 2012.]—Cocoa
es. Inst., Tafo, Ghana.

18. PEREIRA, R. J. C.
Emprêgo de herbicidas na eliminação do "canoão". **(Use of herbicides for the elimination of *Setaria sulcata*.)** *Cacau Atual.*, 1964, **1**(11/12): 3-7, illus.

ve herbicides were compared in 4 trials in a cacao
ea. The treatments were applied once or twice to
taria regrowth 10 or 20 cm. tall or cut back to ground
vel. The best results were obtained with dalapon
hich gave 90% control even after 9 months when
plied in 2 equal doses of 7·5 kg. a.i./ha. with a 15-day
terval. In the last trial dalapon gave effective control
to 2 months after the second application which was
ade 45 days after the first, even at the low rate of
5 kg. a.i./ha./application. TCA, used only in the last
al, also gave good results when applied in 2 equal
ses of 10 kg. a.i./ha. Neither herbicide had any
jurious effects on the cacao. Unsuccessful results
th paraquat are ascribed to the use of too high rates
hich led to rapid destruction of the leaves before
inslocation of the herbicide to the roots, with the
nsequence that the grass was able to recover
mpletely.

19. ZAIGER, D., AND ZENTMYER, G. A.
***Phytophthora* canker of cacao in the Caroline Islands.** *Plant Dis. Reptr*, 1965, **49**: 565-7, bibl. 5, illus.

strain of *Phytophthora palmivora*, different from that
mmon in Central America, caused trunk girdling
nkers which killed large criollo cacao trees in the
roline Islands in 30 to 60 days. Prior to succumbing,
ected trees burst into flower. *Calonectria rigidiuscula*
s present as a secondary disease in affected bark.
fective control measures include the roguing and
rning of badly diseased trees, using sterilized pruning
ols, covering pruning wounds with coal tar and
cising the cankers. [From authors' abstract.]—Plant
th. Lab., Ponape, Eastern Caroline Islands.

8820. TURNER, P. D.
Polyphenoloxidase activity in cacao selections showing variable resistance to *Phytophthora* pod rot. *Plant Dis. Reptr*, 1965, **49**: 319-21, bibl. 5.

In general, the activity of acetone extracts of oxidative enzymes declined with increasing age of pods. Differences were noted between the 3 groups of selections investigated in the activity of powders prepared from the surface (external endocarp) tissues of large immature pods; the activity of resistant selections was usually greater than that of susceptible ones. [From author's summary.]—Cocoa Res. Inst., Tafo, Ghana.

8821. HANSEN, A. J.
Role of the brown jay in epiphytotics of *Thielaviopsis* pod rot of cacao. From abstr. in *Phytopathology*, 1964, **54**: 894-5.

In Costa Rica attempts artificially to infect 75 mature cacao pods by the introduction of a conidial suspension of *Thielaviopsis* (*Ceratocystis*) *paradoxa* into exocarp wounds were unsuccessful; however, all the pods became infected when the endocarp was similarly inoculated. These results were confirmed on pod slices of 10 different varieties in moist chambers. Field observations during a 2-year period revealed that 97% of the pods naturally infected by the fungus had been punctured by the white-tipped brown jay (*Psilorhinus morio*) prior to infection. The fungus generally was not recovered from the mouth-parts of jays feeding on pods, but viable conidia were found throughout the year on discarded pod shells. It is suggested that the role of the jay is one of exposing the susceptible endocarp to infection, rather than as a direct vector of the fungus. Seasonal fluctuations of the jay population or changes in its feeding habits may explain the sporadic pattern of the disease.

8822. CENTRO DE PESQUISAS DO CACAU, ITABUNA, BRAZIL.
Inimigos do cacauicultor: quen-quém. **(Enemies of the cacao grower: the quen-quém ant.)** *Cacau Atual.*, 1964, **1**(9/10): 10-12, illus.

The leaf-cutting *Acromyrmex* ants attack the leaves and the skin and flesh of the pods. Control is by applying BHC, aldrin or chlordane to nests on or below the soil and BHC to nests on the trees.

8823. CENTRO DE PESQUISAS DO CACAU, ITABUNA, BRAZIL.
Inimigos do cacauicultor: lagarta de compasso (*Peosina mexicana* Guenée, 1862). **(Enemies of the cacao grower: the looper caterpillar, *Peosina mexicana*.)** *Cacau Atual.*, 1964, **1**(11/12): 11-12, illus.

Injuries (to leaves, young shoots and pods) and control with 3% BHC dust applied to the branches and trunk and to the soil around the tree.

8824. SILVA, P.
Tripes do cacaueiro—causador do "queima" da fôlha e da "ferrugem" do fruto. **(Cacao thrips, cause of leaf burn and fruit rust.)** *Cacau Atual.*, 1964, **1**(9/10): 1-4, bibl. 8, illus.

Notes are given on the injuries caused by *Selenothrips rubrocinctus* to leaves and fruit, and recommendations are made for control using 50% malathion emulsion at 400 c.c. per 100 l. water [per ha.?] in June-July followed by two further applications at 250 c.c./100 l. at 15–20-day intervals.

8825. Miyamoto, J., Sato, Y., and Fujikawa, K.
Determination of insecticide residue in animal and plant tissues. III. Determination of residual amounts of Sumithion in cocoa beans grown in Nigeria. *Botyu-Kagaku*, 1965, **30**: 49-51, bibl. 4.

The quantity of Sumithion remaining in the beans was approximately 0·1 p.p.m. and the content of *p*-nitrocresol, one of the degradation products of Sumithion, was less than 0·06 p.p.m. [From authors' summary.]

8826. Shimoya, C.
Consideração a respeito dos estaminóides da flor do cacaueiro "Catongo" (*Theobroma cacao* L.). **(Observations on the staminodes of the flower of the cacao variety Catongo.)** [English summary 6 lines.] *Rev. Ceres*, 1965, **12**: 187-98, bibl. 7, illus.

The so-called staminodes are shown to be appendages of the stamens.

8827. Nichols, R.
Studies of fruit development of cacao (*Theobroma cacao*) in relation to cherelle wilt. II. Auxins and development of the seeds. III. Effects of fruit-thinning. *Ann. Bot., Lond.*, 1965, **29**: 181-96, bibl. 30; 197-203, bibl. 9.

Part II: There were 4 consistent growth-active zones on the chromatograms of cacao seeds: 2 acid growth promoters, 1 acid inhibitor and a neutral growth promoter. The activity of one acid promoter (cacao auxin 1) was shown to be similar to that of indole-3-acetic acid. Cacao auxin 1 occurred in roughly equal amounts in seeds of different ages throughout the wilting phase. The other growth substances detected on the chromatograms were unlikely to be associated with wilting phenomena. The only measurable difference between wilting and healthy seeds was in the perisperm, which was smaller in the wilting seeds during the second stage of growth, 50–80 days after fertilization. No differences could be found in the dimensions of the wilting and healthy seeds. The observations on seed development are discussed in relation to growth of the fruit and cacao auxin 1. A summary of the major steps in the development of the healthy and wilting seeded fruit and the hypothetical pathway by which seedless and partially seeded fruits arise is presented. *Part III*: Cacao trees were manually thinned to 1, 2 or 10 pods per tree in order to observe the effect of competition on wilting behaviour. The number of pods wilting and harvested were recorded weekly for 16 months. On the thinned trees a lower percentage of pods wilted than on the controls. Yields from the thinned trees, however, were lower than expected, owing to the continued wilting of those pods left on the trees. The results support the hypothesis that cherelle wilt is a fruit-thinning mechanism, but that biotic factors can cause the same syndrome. [From author's abstracts. For part I see *H.A.*, 35: 6639.]—Univ. W.I., Trinidad.

8828. Schroeder, C. A.
Temperature relations in cacao fruit. *Cacao, Turrialba*, 1963, **8**(4): 8-10, bibl. 5, [received 1965].

Cacao fruit tissues that were exposed to the sun underwent a fluctuation in temperature which was greater than that of the air. Fruits on the north side of the tree or inside the leaf canopy attained lower temperatures than those on the south side. Skin colour was an important factor in determining the amount of heat absorbed by the fruit. Dark red fruits developed higher daytime temperatures than light green fruits. A tem perature gradient within the fruit was demonstrate according to which surface temperatures were highe during the day and comparatively lower at nigh [From author's summary.]

Cashews.

8829. Damodaran, V. K., Abraham, J., and Alexan der, K. M.
The morphology and biology of the cashew flowe (*Anacardium occidentale* L.). 1. Flowering habi flowering season, morphology of flower and se ratio. *Agric. Res. J. Kerala*, 1965, **3**: 23-8, bib 6, illus.

Inflorescences were produced terminally on shoo arising from terminal or lateral fruit buds of the mixe type on past seasons' growth. Flower bud emergenc commenced by the middle of September and continue until the end of February, the main season bein October-November. A study of the morphologic features of the flowers in different trees revealed th there were slight differences in the size of the flower On the same tree the perfect flower was larger tha the staminate flowers. In 2 trees introduced fro Tanganyika the undehisced anthers of the develope stamens were yellowish white in colour compared wit the pink colour in others. The proportion of perfe flowers varied from as low as 0·45% to 24·9% i different trees. A comparison of the sex ratio an the yield of nuts from 28 trees suggested a weak, positiv correlation between these characters. [From author summary.]—Reg. Cashewnut Res. Stat., Kottarakar

8830. Hall, F. J., and Banks, L.
Cashew nut processing.—Part 1. *Trop. Sci* 1965, **7**: 12-26, bibl. 41, illus.

Traditional methods of cashew nut processing a described, and developments in mechanical processin reviewed. An account is given of work at the Tropic Products Institute up to the end of 1964, including ear work on a simple manually operated decorticatio device, and on centrifugal cracking. [Authors' sun mary.]

Coconuts.

8831. British Solomon Islands Protectorate De partment of Agriculture and Lever's Pacif Plantations Pty, Ltd.
Joint Coconut Research Scheme Annual Repor February 1963-August 1964, pp. 32.

Current research is described under the followin headings: *Replanting experiments*, pp. 1-14: Combine trials of fertilizers, methods of replanting and cultur treatments; and the performance of Rennell palms an Fiji hybrid dwarf palms. *Fertilizer experiments* o *mature palms*, pp. 15-16. *Miscellaneous experiment* pp. 17-27: Variety × spacing × fertilizer trial; seque trated trace element trials; cover crops establishmen mulch × K × N trial; introduced varieties; and artifici pollination. *Herbicide trials*, p. 28.

8832. Anon.
Coconut Palm Experimental Station at Rangiro *S. Pacif. Bull.*, 1965, **15**: 33-5, illus., from *Tro Abstr.*, 1965, **20**, Abstr. n1508.

The experimental work carried out by the IRH Coconut Palm Experiment Station on Rangiroa ato (Tuamotu Archipelago) is briefly reviewed. The mai blems of coconut palm growing on atolls are orosis associated with the high level of Ca in the al soil, and N deficiency. Injecting 400 g. iron phate and 100 g. manganese sulphate per palm is ctive for at least 3 years. A promising procedure prevent chlorosis in young palms is the application 10 g. of iron sulphate and 5 g. of manganese sulphate the coir at the base of seedling before planting. ts are being pursued with *Vigna marina*, *Indigofera ecaphylla* and other legumes as cover crops.

3. Dickson, K. B.
Development of the copra industry in Ghana. *J. trop. Geogr.*, 1964, **19**: 27-34, bibl. 8, from *Trop. Abstr.*, 1965, **20**, Abstr. n1306.

istorical review since 1860.

4. Pieris, W. V. D.
Technical note on coconut rehabilitation in the states of Kelantan, Trengganu and Pahang of Malaysia. [*Publ.*] *FAO reg. Off. Asia Far East, Bangkok, Thailand*, 1965, pp. 32.

commendations are made on the selection of planting terial, nursery techniques, fertilizers, tillage, cover ps, green manures, irrigation, demonstrations and earch.

5. de Guzman, E. V., and Del Rosario, D. A.
The growth and development of *Cocos nucifera* L. *makapuno* embryo in vitro. *Philipp. Agric.*, 1964, **48**: 82-94, bibl. 17, illus.

bryos were germinated in White's, Nitsch's and other dified media. In all cases the shoot was well anized and its development proceeded like that hin the seed of a normal coconut. Root growth was uced only after some modifications of the medium cultural conditions. [Authors' abstract.] *Maka-o* nuts have the seed almost completely filled with t solid endosperm.

6. Venkataratnam, L.
Second nursery coconut seedlings have advantages. *Coconut Bull.*, 1965, **18**: 417-19.

rsery seedlings, 1–1½ years old, replanted in second series at 6×6 ft. and planted out 4–5 ft. high after ears, are more vigorous and economic than those nted direct from the initial nurseries.

7. Boyer, J.
Nature de la couverture du sol et influence sur le bilan hydrique d'une cocoteraie. **(The nature of the cover crop and its influence on the water balance of a coconut grove.)** [English and Spanish summaries ½ p. each.] *Oléagineux*, 1965, **20**: 437-40, bibl. 10.

ring the dry season of 1961-62 *Centrosema pubescens*, er as a permanent cover crop or periodically dug in, s compared with natural undergrowth and with bare l in its effects on soil moisture, which was measured a depth of 1·20 m. Bare soil was the best treatment, lowed by permanent *Centrosema*. After 6 weeks of ught the moisture deficit at 0–60 cm. depth was 100% h both these treatments. At 60–120 cm. depth it s 66% with bare soil and 91% with permanent *ntrosema*. In the next dry season smaller differences re recorded, and it was thought that as the palms ed 8 years) grew older the use of *Centrosema* might ve more beneficial. Measurement of stomatal ening by an infiltration method proved more sensitive estimating the water requirements of palms than did asurement of water deficits in leaf samples. The ability of coconuts to survive drought is thought to be due to the thickness of membranes and cuticles rather than to efficient absorption by the roots.—O.R.S.T.O.M.

8838. Nethsinghe, D. A.
Maintaining fertility on coconut lands. *Trop. Agriculturist*, 1963, **119**: 155-66, bibl. 21, [received 1965].

A survey of research in Ceylon on the fertilizer requirements of coconuts, which emphasizes that potash is the main requirement of adult palms whereas the supply of N and P is most important during early growth.

8839. Abeywardena, V.
Economics of fertilizer use. *Trop. Agriculturist*, 1963, **119**: 183-202, bibl. 5, [received 1965].

Four mathematical models for expressing crop response as a function of added fertilizer are compared. A description is given of the method of determining optimum doses where prices are taken into account. The techniques are illustrated by application to data from a fertilizer experiment on coconuts.

8840. Mathew, C.
That button-shedding can be arrested. *Coconut Bull.*, 1965, **18**: 453-5.

Methods recommended for controlling button-shedding in coconuts are: copious irrigation during the summer, liberal applications of fertilizers, improved soil texture, bordeaux or Perenox sprays on the opening inflorescence, and repeated spraying of the female flowers with a mixture of 2,4-D and IBA at 30 p.p.m. each.

8841. Nagaraj, A. N., Pacumbaba, R. P., and Pableo, G. O.
Diagnostic symptoms of cadang-cadang disease of coconuts. *FAO Plant Prot. Bull.*, 1965, **13**: 1-8, bibl. 13, illus.

An examination of leaf samples from a large number of coconut palms in cadang-cadang affected and unaffected areas indicated that both diseased and healthy palms show certain kinds of water-soaked and yellow leaf spots which are not linked with cadang-cadang infection. The results of 4 detailed surveys indicated that a type of irregular olivaceous spot is specific to cadang-cadang and is absent in disease-free areas. These spots are water-soaked in appearance, do not possess brown centres and are distinguishable from the adjacent leaf lamina by their colour and clearly demarcated edges. The basic spots are approximately ¼ to ½ mm. in diam. and in most affected palms they occasionally aggregate to form streaks parallel to the veins. All nut-bearing palms examined, in which such specific spots occurred, also possessed roundish nuts which in most cases were scarified. Since specific leaf spots were present in all affected palms, this is considered the most important diagnostic symptom. When nuts are present and when leaf spots cannot be positively identified, the shape and scarification of nuts provide additional and valuable diagnostic characteristics. Other symptoms, such as mosaic mottling, winging of petioles, bronzing of veinlets and wilting of fronds and leaflets, are not by themselves critical diagnostic symptoms of cadang-cadang. [Authors' summary. See also *H.A.*, 34: 5732.]—Guinobatan Exp. Stat., Albay, Philippines.

8842. Chona, B. L.
Lethal yellowing of coconuts (Cape St. Paul wilt). *Commonw. phytopath. News*, 1965, Part 4, p. 4.

In 1957 imported green and yellow Malayan Dwarf palms and healthy local tall selections were planted in diseased areas in Ghana. By March, 1965, disease incidence in one area was: green Malayan Dwarf 8%, yellow Malayan Dwarf 33% and local tall palms 42%.

8843. Holmes, F. O.
Trials to control coconut root-wilt. *Indian Fmg*, 1965, **15**(2): 13-14, illus.

Projected experiments are described which involve felling diseased palms and spraying them with insecticide to destroy the possible vector, *Stephanitis typicus*.

8844. Lily, V. G., Nair, U. K., and Pandalai, K. M.
On the need for prophylactic spraying of palms for leaf attack in mixed gardens of coconut and arecanut palms. *Arecanut J.*, 1965, **16**(1): 5-9, bibl. 5.

The causes of leaf rot disease are shown to be the same in both areca and coconut palms. *Helminthosporium* and *Gloeosporium* spp. were able to infect whole, healthy leaves of both species; *Fusarium* and *Pestalotia* spp. were only capable of penetrating an already damaged leaf. The spraying of both areca and coconut palms with bordeaux when grown together is recommended.—Central Coconut Res. Stat., Kayangulam.

8845. Manciot, R.
Lutte chimique contre le Brontispa du cocotier. **(Chemical control of *Brontispa longissima* on coconut palms.)** *Oléagineux*, 1965, **20**: 369-71, bibl. 2, illus.

The parasite and the damage it causes are described and illustrated. Attempts at biological control have not yet been successful. The recommended method of control is systematic and regular spraying using 1 l. of 0·15% dieldrin per 150 l. water, 10–15 c.c. of the mixture being applied to each plant. Complete protection of young palms is ensured by spraying every 6 weeks.

8846. Puttarudriah, M., and Sastry, K. S. S.
Incidence of the coconut caterpillar, *Nephantis serinopa* Meyr., in Bangalore. *Curr. Sci.*, 1964, **33**: 340, bibl. 7, illus.

The presence of the caterpillar was confirmed and its life cycle was studied.

8847. Ospina Leon, A.
La "gualpa", enemigo mortal de cocotero. **(The palm weevil, mortal enemy of the coconut palm.)** *Agric. trop., Bogotá*, 1963, **19**: 412-15, illus.

Notes are given on the life cycle of *Rhynchophorus palmarum* and injuries to leaf, flowers and terminal bud which lead to the death of the palm. Control in newly attacked palms is by removing the larvae from infested parts and treating the crown with aldrin or Endrex. Pits containing decaying vegetable matter and sprayed with insecticide are successfully used to attract egg-laying females. Dead palms and stumps should be destroyed.

8848. Davis, T. A.
The robber crab. *Coconut Bull.*, 1965, **18**: 456-65, illus.

Birgus latro and reports regarding the damage it causes are discussed.

8849. Jayasankar, N. P., and Bhat, J. V.
The role of *Micrococcus* sp. in coir fermentation. *Curr. Sci.*, 1964, **33**: 369, bibl. 8.

Forty strains of *Micrococcus* were isolated from ret liquors collected from 7 areas where coconut husks are retted in saline backwaters.—Indian Inst. Sci., Bangalore.

Coffee—general, collections and clones.

8850. Tanganyika Coffee Board.
Research Report, 1963, of the Coffee Rese Station, Lyamungu, and Coffee Research Serv Tanganyika, 1965, pp. 78.

Work in progress, and in some cases completed, incl *Agronomy*, pp. 12-13: Experiments with shade, irr tion, mulch, N fertilizer and pruning treatments; ap cation of mulch, N, Cu spray and irrigation to sha and unshaded coffee; production of mulch mate and herbicide trials. *Agricultural chemistry*, pp. 13 The possibility of basing fertilizer use in arabica c upon leaf analysis; correlation of leaf nutrient le with yields in fertilizer experiments; influence of spray on leaf mineral composition; correction c deficiency; correction of Fe deficiency symptoms their connection with amber bean production; an investigation of the apparent loss in soil fertility u continuous coffee-growing. *Entomology*, p. 14: control studies. *Horticulture*, pp. 14-17: Breeding resistance to rust and coffee berry disease; new cros vegetative propagation; nursery fumigation; p introductions; pruning methods; and investigatio the possibilities of adapting modern temperate orc culture technique for use in coffee. *Plant patho* pp. 17-18: Studies on leaf rust and Lyamungu die *Plant physiology*, p. 18: Relationship between amount and type of foliage and crop production; prolongation of leaf life by Cu sprays. *Proces* pp. 18-19: Tests of mechanical devices; optim moisture content of dried coffee; post-ferment soaking; and the effects of plastic and sisal bag keeping qualities. *Farm management*, pp. 20 Including crop summaries. Ten research papers been abstracted separately.

8851. Cidade, H. T., and Pereira, N. N.
Bibliografia de café 1963. Extractos de li folhetos e artigos sobre café, publicados em e classificados segundo a classificação déci universal (C.D.U.). **(Coffee bibliography 1 Extracts from books, pamphlets and articles coffee, published in 1963 and classified accor to the Universal Decimal Classification.)** *Co Miss. Estud. agron. Ultramar, Lisboa*, **48**, 1 pp. 267+19.

8852. Taylor, J. A.
Kenya's experience may benefit Rhodesia c industry. *Rhod. agric. J.*, 1965, **62**(2): 40-1, illus.

Notes on climate, shade, irrigation, mulching, nutriti pruning, pests, diseases and processing.

8853. Awatramani, N. A.
Glimpses of the way out of the impasse in conduct of field experiments on coffee at Cen Coffee Research Institute. *Indian Coffee*, 1 **29**(4): 25-9, 34, bibl. 5.

Advice on improved experimental techniques, inclu data and discussion on the coefficients of variab and on the percentage differences between hig and lowest mean yields for various numbers of tr ments and replications observed in experiments at Institute from 1961 to 1964.

8854. Narasimhaswamy, R. L.
***Coffea arabica* L. collections from Ethio** *Indian Coffee*, 1965, **29**(5): 14-30, bibl. 3.

mples of *C. arabica*, collected in Ethiopia by an FAO edition, are discussed and tabulated, giving descripns, places of origin and where seeds have been sent.

5. Meyer, F. G.
Notes on wild *Coffea arabica* from southwestern Ethiopia, with some historical considerations. *Econ. Bot.*, 1965, **19**: 136-51, bibl. 34, illus.

e wild plant was found in abundance in the rain est of south-western Ethiopia in 1961-2. Considere genetical variability was observed. *Hemileia tatrix* co-existed with *C. arabica* in rain-forest tricts and appeared not to be a problem. The gus *Aschersonia goldiana* was also found on *C. bica* leaves and on scale insects on the plant.

6. Lems, G.
Enige resultaten van de eerste vijf produktie jaren van een koffie observatie-aanplant met Liberiaklonen. **(Some results of the first five bearing years of an observation plantation of liberica clonal coffee.)** [English summary 6 lines.] *Surinaam. Landb.*, 1965, **13**: 3-9.

tes are given on yield, habit, cherry and bean characs and maturation season of the best 24 clones of a al of 133 tested in Surinam.

7. Fernie, L. M.
The behaviour of arabica coffee clones on different pruning systems. *Tanganyika Coffee Bd Res. Rep. 1963*, 1965, pp. 60-7, bibl. 3.

gle- and multiple-stem pruning systems were comed in 2 trials using 2 Kent and 4 Bourbon clones. e annual yields for each are tabulated for the period 3-61. With the exception of Bourbon N.39, higher l more regular yields were obtained from the Kent nes on both systems. The mean overall difference in ds between the pruning systems was in favour of ltiple-stem. Positive correlations existed between mean yields on multiple-stem and those on singlen, also between the annual yields of the strong clones the 2 systems and between the annual yields of the ak clones on the 2 systems. The A and PB grade centages and liquoring classes for clones in 1953 and 4 are tabulated; high percentages were produced by Kent clones and by N.39. Differential pruning on ltiple-stem was carried out for 2 years; the results icated that it was possible to control biennial bearing regular pruning on multiple-stem in the case of ong clones but not in the case of weak ones. In both ls the clonal differences were the most outstanding.

Coffee—soils, planting and growth.

8. Chokkanna, N. G., Gowda, B. S. P., and Rao, W. K.
Studies on coffee soils. *Indian Coffee*, 1965, **29**(4): 11-24, bibl. 12.

dies on certain heavy, badly drained, acid soils in sore State on which coffee growth was persistently r.

9. Mitchell, H. W.
Results of a coffee and banana interplanting trial in Bukoba. *Tanganyika Coffee Bd Res. Rep. 1963*, 1965, pp. 25-30, bibl. 5.

height growth and yield of both arabica and usta coffee planted at 200 trees per acre were reduced gressively by increasing densities of interplanted anas. Banana yields and bunch size from bananas planted at 400 stools per acre were not greatly affected by the presence or absence of interplanted coffee. Reduction of the density of bananas interplanted in coffee from 400 stools per acre to 200 stools and 100 stools resulted in lower total banana production, which was partially offset by the higher rate of fruiting and larger bunches from the wider spaced plants. Further trials are needed to determine the optimum planting system for producing the maximum amount of coffee and bananas per unit of land. [Author's summary.]

8860. Townsend, C. H., and others.
Cultivo de hule (*Hevea brasiliensis*) intercalado en cafetales. **(Cultivation of rubber interplanted in coffee plantations.)** *Bol. téc. Inst. agropec. nac.*, 1964, No. 6, pp. 1-6, from *Trop. Abstr.*, 1965, **20**, Abstr. n1582.

Coffee growers in Guatemala at altitudes up to 750 m. are recommended to replace their shade trees with rubber trees planted on the contour at a spacing of $10 \times 3{\cdot}3$ m.; coffee bushes less than 0·9 m. from the rubber rows should be removed, those between 0·9 and 1·8 m. from the rubber should be pruned back. In order to render the coffee more tolerant of the change, it is recommended to apply 56 g. urea per bush to the soil in May-Sept. and 85 g. in Nov., and to spray 4 times a year with a mixture of urea, $MnSO_4$, $ZnSO_4$ and borax.

8861. Rabéchault, H., and Cambrony, H.
La physiologie du caféier. 1. De la germination à le morphogenèse. 2. La croissance (système radiculaire). **(Physiology of the coffee tree. 1. From germination to morphogenesis. 2. Growth of the root system.)** *Phys. Plantes trop. cult.*, 1964, **1**(1): 1-63, bibl. 291, illus.; and **2**(2): 1-34, bibl. 104.

These first 2 parts of a comprehensive bibliographical survey cover the following subjects: *Part 1*: Germination, vegetative propagation, behaviour of buds during morphogenesis, physiology of morphogenesis and the effects of pruning. *Part 2*: Methods of root study, the growth and development of roots, the effects of the external factors, soil, water availability, temperature, competition, micro-flora and micro-fauna, cultural practices and injuries, and the effects of internal factors, viz. the interaction between roots and aerial parts.

8862. Fernie, L. M.
Some factors influencing the growth of coffee seedlings in the nursery. *Tanganyika Coffee Bd Res. Rep. 1963*, 1965, pp. 56-9, bibl. 3.

The treatments in this nursery trial involved root pruning, fumigation with Nemagon at 1 c.c./sq. ft. or DD at 6 c.c./sq. ft. and the use of fresh forest soil or exhausted nursery soil. No growth responses to the fumigation treatments were observed although root-knot nematodes were partially controlled. Various growth measurements indicated the striking superiority of the fresh soil over the nursery soil. Root pruning depressed the growth and dry weight of the aerial parts, but the lateral roots that arose from the restricted tap-roots had the same dry weights as those arising from natural unpruned tap-roots.

8863. Creencia, R. P., and others.
The effect of different degrees of shade upon the growth and development of coffee seedlings. *Coffee Cacao J.*, 1964, **7**: 146-7, 157, bibl., from *Trop. Abstr.*, 1965, **20**, Abstr. n1271.

Coffee seedlings, 220 days old and raised in a greenhouse, were transplanted to beds without shade or with artificial shade of 25, 50 or 75% intensity. During the next 12 months the mean monthly increments of height, number of nodes and number of branches increased with the degree of shade, while the girth showed a maximum increment under 50% shade. However, differences between the height increments under 50 and 75% shade, and between the increments in girth, number of nodes and number of branches under 25, 50 and 75% shade were not significant.

Coffee—weed control, nutrition and composition.

(*See also* 8860.)

8864. Green, D. H., and Kalogeris, B.
Soil-acting herbicides in coffee. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 18, bibl. 3.

Two trials were laid down in March in the inter-rows of bearing coffee on red volcanic, clay loam soil at Lyamungu to compare the costs of treatments and to study the problem of soil erosion during the long rains in relation to the use of soil-acting herbicides. In the first trial bromacil at 0·25–4 lb. and 5 other compounds at 0·5–8 lb./acre were applied from a logarithmic sprayer to freshly-cultivated ground in 115 gal. of spray. After 6 weeks adequate control was being obtained with bromacil at 0·2 lb., diuron at 0·5 lb., atraton at 0·8 lb., C 2059 (*N*-(3-trifluoromethylphenyl)-*N′N′*-dimethylurea) at 1·1 lb., atrazine at 1·6 lb. and simazine at 1·8 lb./acre. The rates required for adequate control after 16 weeks were: atraton = 2 lb., bromacil = 2·8 lb., C 2059 = 2·9 lb., diuron = 3·2 lb., simazine = 3·8 lb. and atrazine = 4·9 lb./acre. Since in Tanganyika control is required for 16 weeks during the long rains (March/May) and for a further 10 during the short rains (end of year), the total annual outlay on materials, taking into account split treatments where these are more economical, would be bromacil (3×0·5 lb./acre) = 75 E. African shillings, diuron (3–4×1·5 lb./acre) = 126–168s., atraton (2×2 lb./acre) = 140s., C 2059 (3×1·5 lb./acre) = 126s., and simazine and atrazine (3×2 lb./acre) = 180 and 240s., respectively. These amounts should be compared with the cost of hand weeding, which was 60–72s. per acre in 1961. In order to maintain a continuous cover on the soil to combat erosion, treatments were applied in the second trial to a dense stand of broad-leaved weeds and *Digitaria velutina*, which emerged during the 2-week interval between cultivating (just before the onset of the rains) and spraying. Bromacil at 2 lb., diuron at 4 lb. and atraton at 2·5 lb./acre, each in 60 gal. spray, gave good control and the residual effect lasted 12–13 months from the date of cultivation. Even on a basis of 2 annual treatments, this gives an outlay for materials alone of 200s., 224s. and 215s.[?], respectively.—Trop. Pestic. Res. Inst., Arusha, Tanzania.—From *Weed Abstr.*, **14**, No. 119.

8865. Green, D. H., and Kalogeris, B.
Further evaluations of mixtures of soil-acting and contact herbicides for the control of weeds of coffee in Tanganyika. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 14, bibl. 4.

Six soil-acting herbicides were applied in March to weeds 9 in. high on red volcanic, clay loam soil in the inter-rows of bearing coffee. Treatments, either alone or in conjunction with a logarithmically decreasing ra of paraquat (1·5–0·9 lb./acre) or amitrole (5–0·3 l acre), were made in 115 gal. of spray. Alone, diur at 4 lb. gave control for 3½ weeks, atraton at 3 lb. f 4½ weeks and bromacil at 1 lb./acre for 5 weeks. T addition of paraquat at 0·2 lb./acre (or amitrole at 1 l to diuron, that of amitrole at 2·3 lb./acre (or paraqua 1·1 lb.) to atraton and that of amitrole at 2·5 lb./ac (or paraquat at 1·4 lb.) to atrazine was required prolong the residual effect up to 3 months. As previous trials amitrole was preferred for adding to triazine and, in general, paraquat for use with a ure Paraquat at 0·5 lb./acre extended the residual effect bromacil to 12 weeks, and, at a cost of 90 E. Afric shillings for 2 band treatments of the coffee rows, th mixture was considered the most economical. [See al *H.A.*, 34: 1722.]—Trop. Pestic. Res. Inst., Arush Tanzania.—From *Weed Abstr.*, **14**, No. 121.

8866. Green, D. H.
Evaluation of 4 new soil-acting herbicides and soil-acting herbicides with added Agral 90 wetti agent for the post-emergence control of weeds coffee. [Pap. read at] *3rd E. Afr. Conf. on So acting Herbicides, Nairobi, 1964*, pp. 13, bibl.

Low rates of a number of soil-acting herbicides, alo and in combination with logarithmically decreasi concentrations (3–0·18% v/v) of the wetter Agral were examined for their contact activity on weeds up 2 ft. high in the inter-rows of bearing coffee. N gave adequate control for even 1 week when used alo but all except C 2059 [*N*-(3-trifluoromethylphen *N′N′*-dimethylurea] at 1·25 lb. and atrazine at 1 lb./ac did so when applied with the wetter. The requir concentrations of wetter were: for prometryne at 1· lb. = 1·2%, for diuron at 1 lb. = 1·7%, for bromacil 0·5 lb. = 1·5%, for H 7175 (1-(chloro-2-norborny 3,3-dimethylurea) at 1 lb. = 1·9%, for atraton at 0· lb. = 2·2% and for simazine at 1 lb./acre = 2·7 Prometryne, diuron and simazine continued to mai tain control after 3½ weeks where the respective conce trations of wetter exceeded 1·5%, 1·6% and 2·4 Four experimental triazines applied at 1 lb./ac without a wetter failed to provide adequate over control, but one of these, GS-11357 [2-methylthio- methylamino-6-*n*-propyl-amino-1,3,5--triazine], pr vided better control of the dominant weed speci *Digitaria velutina*, than did any other compound appli without a wetter.—Trop. Pestic. Res. Inst., Arush Tanzania.—*Weed Abstr.*, **14**, No. 120.

8867. Blore, T. W. D.
Herbicide trials in Kenya arabica coffee in 19 [Pap. read at] *3rd E. Afr. Conf. on Soil-acti Herbicides, Nairobi, 1964*, pp. 7, bibl. 4.

In trials during the 1964 long rains the weed contr provided by desmetryne and ametryne at 3 lb./acre coffee on red loam soil at Ruiru compared favourab with that given by an equivalent rate of simazine atrazine, expecially in respect of annual grasse Diuron and prometryne at 3 lb./acre were the best the herbicides commercially available. In a trial co paring diuron, simazine and atrazine on more san soil under lightly shaded coffee at Kitale diuron alo gave acceptable control for 11 weeks. Experien obtained in treating a pure stand of *Oxalis esculen* suggests that the use of amitrole at 2 lb./acre in co junction with a soil-acting herbicide might render or pt-treatment necessary afterwards. [See also *H.A.*, 2087.]—Coffee Res. Stat., Ruiru, Kenya.—*Weed str.*, **14**, No. 117.

58. Blore, T. W. D.
A note on the persistence of diuron in a coffee soil. *Kenya Coffee*, 1965, **30**: 115-19, bibl. 4, illus.

x experiments with tomato and coffee seedlings bjected to different diuron treatments with or without pier grass mulch led to the conclusion that, on kuyu red loam, soil-acting herbicides should be used conjunction with grass mulch or, if regular mulching ot possible, the type of soil-acting herbicide should be nged frequently, preferably every year.

9. Twiga Chemical Industries Ltd.
Soil-applied herbicides in East African plantation and agricultural crops: coffee. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 3.

rmex (diuron 80%) may be applied without injury to fee provided care is taken to avoid contact with foliage of any suckers which may be present. A rate 4 lb./acre commercial product applied to moist soil en rain is imminent controls weeds for 4–6 months. eral weed species were, however, resistant. Where chines are used, current practice favours nozzles ced 1 ft. apart and delivering 40–50 gal. spray/acre at ressure not exceeding 20 p.s.i. In small-scale trials ious other herbicides either injured the coffee or did provide adequate weed control.—From *Weed Abstr.*, No. 116.

0. Blore, T. W. D.
A note on the use of bromacil in arabica coffee in Kenya. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 2.

er 90% of 4-year-old single-stem arabica coffee trees e dead within 9 months when application of bromacil 5 lb./acre with or without 1 pint paraquat was owed by prolonged heavy rain. Trees which eived bromacil at 2·5 lb./acre plus 1 pint paraquat ered severe defoliation and die-back.—Coffee Res. t., Ruiru, Kenya.—*Weed Abstr*, **14**, No. 118.

1. Aguilar Rivas, J.
Fertilizantes nitrogenados sintéticos y su empleo en la fertilización del cafeto. **(Artificial nitrogenous fertilizers and their use in the fertilization of the coffee tree.)** *Bol. inf. Inst. salv. Invest. Café, El Salvador*, **62**, 1965, pp. 1-5.

visory notes, including a comparison of forms of N.

2. Mphuru, N. E.
The effect of fungicide and fertilizer treatments on yields of coffee on peasant farms. *Tanganyika Coffee Bd Res. Rep. 1963*, 1965, pp. 31-4.

ing the first 2 years of this trial (1961-1963) the ilizer employed was ammonium sulphate nitrate lied at 3 oz. per tree in November, March and June. oper fungicide was applied in accordance with the ial spray programme, viz. 5 lb. of 50% active Cu in gal. water per acre in October, November, January, ruary and March. The use of fungicides increased mean yields by 47% in the first season and 90% in second; for N fertilizer the corresponding figures 8% and 12%, respectively. By the second year "good" farms did not significantly outyield the or" farms, but significantly lower yields were ined from farms at the lowest altitudes above sea l.

8873. Ali, S.
A report on an investigation into "iron chlorosis" in arabica coffee and its relationship to amber beans. *Tanganyika Coffee Bd Res. Rep. 1963*, 1965, pp. 35-8, bibl. 5.

Treatments applied in December, 1962, to coffee which had shown severe "iron chlorosis" symptoms included Fe sulphate injection of 2–4 g./tree, Mn sulphate injection of 2–4 g./tree, Mn sulphate+Fe sulphate injection, Na molybdate 0·1% bi-monthly foliar spray, Na molybdate spray+Mn sulphate injection, and Na molybdate injection of 0·1 g. in kaolin. "Iron chlorosis" did not recur and few amber beans were subsequently produced. The results of chemical analysis of leaf samples indicated that the treatments had no effect on K, Ca and Mg levels; leaf Fe was increased by Fe injection but not by Fe+Mn injection, and the lowest level of Fe was shown by the Mo injection treatment. Considerable but temporary increases in leaf Mn were caused by treatments which included Mn sulphate injection. Differences in percentages of amber beans between treatments were not significant but the higher percentages were associated with and possibly induced by abnormally high leaf Mn. It is suggested that "iron chlorosis" may be associated with Mn deficiency in the presence of adequate Fe when the K/Mg ratio is high, and that the utilization of Fe by coffee trees may be impaired when Mn levels are abnormal.

8874. Ananth, B. R., Iyengar, B. R. V., and Chokkanna, N. G.
Widespread zinc deficiency in coffee in India. [Spanish summary 9 lines.] *Turrialba*, 1965, **15**: 81-7, bibl. 40, illus.

Foliar sprays of 0·25% zinc sulphate were more effective and more economic than heavy soil applications of Zn either as sulphate or chelate, in correcting Zn deficiency of coffee. No cases of Zn toxicity resulted from the treatments.

8875. Prophete, J.
Efecto de aspersiones de azúcar y boro sobre el crecimiento y la nutrición mineral del café. **(The effects of sugar and boron sprays on the growth and mineral nutrition of coffee.)** [English summary 8 lines.] *Turrialba*, 1965, **15**: 141-4, bibl. 19.

Spraying with B alone increased the height of young coffee plants and the B content of the leaves. Spraying with sugar alone tended to lessen the height increase and the number of leaves per plant and enhanced the dry-matter content of the stems. A combination of 7·5% sugar and either 50 or 100 p.p.m. of B gave the greatest increase in plant height. The B content of the leaves of adult plants rose with increasing B application, but combining sugar with B resulted in smaller increments, particularly at the higher B level.—Inter-Amer. Inst. agric. Sci., Turrialba, C.R.

8876. de Barros, M. A. A.
Estudo comparativo das domácias de fôlhas normais e domácias de fôlhas cujas plantas foram cultivadas com deficiências e excessos de micronutrientes (Fe, Mn, Mo, e Cu), em *Coffea arabica* L. variedade caturra K.M.C. **(Comparative study of the domatia of normal leaves and of leaves grown with deficiencies or excesses of micronutrients (Fe, Mn, Mo and Cu) in Caturra coffee.)** [English summary 6 lines.] *An. Esc. sup. Agric. Queiroz*, 1963, **20**: 229-40, bibl. 5, [received 1965].

In the leaves of plants grown with micronutrient deficiencies and excesses the domatia (cavities in the leaf parenchyma connected with the exterior) showed changes in size, in the shape of the mouth and in their epidermal cells.

8877. Arzolla, S., and others.
Estudos sôbre a alimentação mineral do cafeeiro. X. Extração de macronutrientes na colheita pelas variedades "Mundo Novo", "Caturra" e "Bourbon Amarelo". **(Studies on the mineral nutrition of the coffee tree. X. Extraction of macronutrients from the cherries of the varieties Mundo Novo, Caturra and Yellow Bourbon.)** [English summary ¾ p.] *An. Esc. sup. Agric. Queiroz*, 1963, **20**: 41-52, bibl. 8, [received 1965].

Determinations were made of the macronutrient contents of the beans and pulp of cherry samples from plantations on the 3 chief coffee soils of São Paulo, viz. terra roxa legitima (Ribeirão Preto Experiment Station), massapésalmourão (Mocóca) and arenito de Bauru (Pindorama). Figures are presented for fresh and dry weights of beans and pulp per kg. cherries and their ratios for each of the three varieties, contents of N, P, K, Ca, Mg and S in bean and pulp as percentages of dry matter, and the weights of these elements contained in 60 kg. clean coffee and 30 kg. husk.

8878. Baker, R. M.
Routine analysis of six elements in plant ash. *Tanganyika Coffee Bd Res. Rep. 1963*, 1965, pp. 51-5, bibl. 3.

A scheme for the rapid routine analysis of P, K, Ca, Mg, Fe and Mn in a large number of samples of coffee leaves.

Coffee—diseases and pests.

(*See also* 8862.)

8879. Firman, I. D.
Some investigations on a disease of *Coffea arabica* caused by *Ascochyta tarda*. *Trans. Brit. mycol. Soc.*, 1965, **48**: 161-6, bibl. 8, illus.

Ascochyta tarda causes a leaf blight and die-back of young stems and branches of coffee in Kenya. Available evidence has indicated that *A. tarda* is a wound pathogen following crinkle-leaf lesions and damage by *Epigynopteryx* caterpillars. In preliminary field trials captan, used against crinkle-leaf, has also reduced damage by *A. tarda*.—Coffee Res. Stat., Ruiru, Kenya.

8880. Awatramani, N. A.
***Cercospora* incidence in relation to growth of coffee seedlings in different containers. II. A confirmatory note.** *Indian Coffee*, 1965, **29**(5): 8-10, bibl. 2.

Observations confirming a previous report [*H.A.*, 34: 3749] that the incidence of leaf spot was lower in seedlings grown in polythene bags than in those grown in baskets.

8881. Burdekin, D. A.
Laboratory inoculations with *Hemileia vastatrix* Berk et Br. *Tanganyika Coffee Bd Res. Rep. 1963*, 1965, pp. 39-41, bibl. 1.

Copper deposits up to 6 weeks old from Pereclor, Perenox and bordeaux mixture, which had aged in the field and been subjected to heavy rain, were found to be toxic to *H. vastatrix* in the laboratory. Where infection occurred it was noted that no visible copper deposit was present. The fungicides NC 918 at 0·5% by weight, Acti-dione BR at 0·1% of concentrate and Blasticy at 0·1% of powder were also tested. Acti-dione v the best but was phytotoxic in the concentration use NC 918 and Blasticydin did not exert complete contr but applications within 10 days of inoculation reduc infection considerably.

8882. Firman, I. D.
A review of leaf rust and coffee berry disease cont in Kenya. *Kenya Coffee*, 1965, **30**: 201-11, bi 44.

See *H.A.*, 35: 6683.

8883. Abrego, L.
Resultados preliminares de ensayos tendiente prevenir las afecciones radiculares del cafe **(Preliminary results of trials for the control of r disorders of coffee.)** *Bol. inf. Inst. salv. Inv Café, El Salvador*, 1965, No. 63, pp. 3-5, ill

The treatments in split-plot experiments at seve localities for the control of root disorders due to nen todes, fungi and insects were: DD applied in 10 inj tions of 2·5 c.c. each at 10 in. depth round the hol weeks before planting; 75% PCNB at 30 g. in 1 g water applied round the hole at planting; 2·5% ald at 60 g. per hole mixed with the surface soil the c before planting; and coffee pulp at 30, 60 and 90 lb. hole. At one locality there were significant response DD, to pulp and to PCNB plus 60 lb. pulp, and pl mortality fell with increasing rate of application of p At another there was a significant response to DD, a coffee pulp was also beneficial.

8884. D'Souza, G. I., and Sreenivasan, C. S.
A note on the reniform nematode, *Rotylench reniformis* L & O (Pratylenchinae: Nemata arabica coffee in South India. *Indian Cof* 1965, **29**(5): 11-13, bibl. 7, illus.

Biology of the nematode and symptoms of infestati

8885. Anon.
El ácaro del café. **(Coffee red spider mite.)** *B téc. Minist. Agric. Ganad., Costa Rica*, **47**, 19 pp. 26, bibl. 4, from *Trop. Abstr.*, 1965, **20**, Ab n1035.

Oligonychus coffeae: injuries to leaves and control w tetradifon, demeton-methyl and phorate.

8886. Heinrich, W. O.
Aspectos do combate biológico às pragas do c **(Aspects of the biological control of coffee pes** *Biológico*, 1965, **31**: 57-62.

In Brazil, as well as in Ceylon and Java, the biologi control of *Hypothenemus hampei* by introducing parasitic wasp *Prorops nasuta* has been abando because of the difficulty of raising the parasite artificia The temporary success in Kenya of liberating *Anagy kivuensis* to control *Planococcus kenyae* is discuss together with the advantage of combining this meth with chemical control of the associated ants. preliminary field trials suspensions of the fun *Verticillium lecanii* sprayed on coffee plants infes with *Saissetia hemisphaerica* gave promising results.

8887. Sekhar, P. S., and others.
Investigations on thrips of "arabica" cof *Coffea arabica* L. II. Ecological relations and control of *Scirtothrips sweetmani* Bian [Spanish summary 12 lines.] *Turrialba*, 19 **15**: 14-19, bibl. 10.

Ecological relationships are described. Dimec alone or in combination with dieldrin gave satisfact ntrol when applied twice with an interval of 3 weeks tween the applications. [For part I see *H.A.*, 35: 70.]—Cent. Coffee Res. Inst., Chikmagalur, Mysore.

88. GANDIA, I. M., AND BONCATO, A. A.
A note on the occurrence of the coffee borer in the Philippines. *Coffee Cacao J.*, 1964, 7: 124-5, 138, from *Trop. Abstr.*, 1965, **20**, Abstr. n1281.

easures recommended for the control of the recently roduced *Stephanoderes hampei* include growing at de spacing under light shade, composting the pulp fore returning it to the plantation and insecticidal aying.

Coffee—processing and quality.

89. BROWNBRIDGE, J. M. C.
An assessment of the "Raoeng" pulper in arabica coffee. *Tanganyika Coffee Bd Res. Rep. 1963*, 1965, pp. 42-5, bibl. 4.

e machine removes skins and mucilage from cherry in ingle operation, obviating the need for fermentation. series of mechanical modifications during preliminary als reduced bean damage to an acceptable level. The ality of coffee which had been processed by the aoeng" followed by 48 hours' soaking under water not differ appreciably from that of conventionally ocessed coffee.

90. BROWNBRIDGE, J. M. C.
Fermentation experiments—1963/64. *Tanganyika Coffee Bd Res. Rep. 1963*, 1965, pp. 46-50, bibl. 1.

e 2-stage fermentation method, i.e. dry fermentation owed by washing and soaking for 24 hours, enced coffee quality. Extension of the soaking period 48 hours gave no improvement. Chemical additives ing the post-fermentation soak affected quality ersely, except for hydrogen peroxide at 0·35% w/v. increased rate of mucilage breakdown during mentation was found to be directly proportional to amount of mechanical stirring employed. Quality provement due to stirring during the subsequent king was also indicated.

1. BROWNBRIDGE, J. M. C., AND WOOTTON, A. E.
Recent developments in coffee processing. *Kenya Coffee*, 1965, **30**: 187-96, bibl. 5.

2 stages of fermentation are discussed, together with chemical removal of mucilage, its removal by pectic ymes and by machine, and drying.

2. FERNIE, L. M.
A preliminary investigation into certain factors influencing the quality of arabica coffee in Tanganyika. *Tanganyika Coffee Bd Res. Rep. 1963*, 1965, pp. 68-78, bibl. 12.

ious aspects of raw and roast coffee and of liquor e studied and related to selections, picking season, of trees, locations, pruning systems and shade. The combined results are presented in tabular form. Bourbon selections were of better quality than the nt in respect of raw appearance and liquor. Early on beans had a better colour in the raw and were coated than those from later pickings, whereas lateon beans produced the best liquor. Beans from the ngest trees appeared to give the best quality coffee in respects. Quality variations due to location were rded. The effects of pruning and shade were terminate. It is emphasized that the investigation limited to one season.

8893. BLORE, T. W. D.
Some agronomic practices affecting the quality of Kenya coffee. [Spanish summary ¼ p.] *Turrialba*, 1965, **15**: 111-18, bibl. 13.

Coffee quality was adversely affected by prolonged mulching with elephant grass (*Pennisetum purpureum*). The effects were similar to those previously recorded for cattle manure. The application of 50 lb./acre of Mg in one trial helped to restore quality where mulching had been very prolonged, but had no effect in other trials where the coffee had been mulched for 6 years or less. The high K content of elephant grass is thought to be responsible for the adverse effect.—Coffee Res. Stat., Ruiru, Kenya.

8894. HEESTERMAN, J. E.
The taste of Liberia coffee and of the instant coffee prepared from it. *Publ. roy. trop. Inst., Amsterdam*, **282**, 1964, pp. 9.

Liberica coffee from Surinam. [For the report in French on which this text is largely based see *H.A.*, 34: 5777.]

Guavas.

(*See also* 7254.)

8895. ESPIRITU, L. G.
The effects of calcium and irradiation on pollen tube growth. *Philipp. Agric.*, 1964, **48**: 49-60, bibl. 14, illus.

The pollen was taken from guava, *Crotalaria juncea*, *Momordica balsamina* and *Crinum asiaticum*. Germination and tube elongation were markedly stimulated by the addition of as little as 30 p.p.m. Ca^{++} to the basic sucrose culture medium; 300 p.p.m. was the optimum concentration for all species, but 3,000 p.p.m. or more caused serious inhibition. Irradiation studies were conducted using *Crotalaria* pollen.

8896. SESHADRI, T. R., AND VASISHTA, K.
Polyphenolic components of guava fruits. *Curr. Sci.*, 1964, **33**: 334-5, bibl. 2.

Fruits were examined when unripe, half ripe and fully ripe. A sugar ester of ellagic acid was detected in unripe pulp; it was established as an ester of hexahydroxydiphenic acid with L-arabinose. The amount of ester decreased considerably in half-ripe pulp and none was detected in ripe pulp. Free ellagic acid increased with ripening, as did glucose, maltose and arabinose. The red skins of apple guavas were found to contain a cyanidin diglucoside. Leucocyanidin, present at all stages, decreased with ripening. [See also *H.A.*, 34: 3769.]—Delhi Univ.

Mangoes.

8897. RAMESHWAR, A.
A dwarf mango for your home garden. *Indian Hort.*, 1964, 9(1): 26, illus.

Morphological characteristics of the variety Mahmuda Vikarabad.

8898. KALIFA, A. S., EL-AZZOUNI, M. M., AND WALI, Y. A.
Physiological studies on mango cuttings. *Indian J. Hort.*, 1964, **21**: 179-85, bibl. 5.

In a trial with mango cuttings these remained alive longer after 24 hours in running water than was obtained by using hot-water or hexane dip or by burning the base. In a growth-substance trial longevity was greatest after treatment with 100 p.p.m. IBA plus

10 p.p.m. vitamin B_1 plus 2% ammonium sulphate plus 2% sucrose. In a cold-storage trial at unspecified temperature 20 days was the optimum period. One-leaf middle cuttings remained alive longer than leafy or leafless terminal cuttings.—Ain Shams Univ., Cairo.

8899. Nair, N. G.
Studies on the control of *Loranthus elasticus* Desrouss. parasitising *Mangifera indica* Linn., using 2,4-D. *Agric. Res. J. Kerala*, 1965, 3: 29-31, bibl. 5, illus.

2,4-D in concentrations of 0·3, 0·4 or 0·5% was applied as a single spray, twice with a 5-day interval and twice with a 10-day interval. At the lowest concentration a single spray did not kill the parasite but 2 applications did so in 36 days. A single application at either of the higher concentrations was sufficient. The compound also killed the host twigs, although more slowly, but did not affect large mango branches and trunks.—Agric. Coll. Res. Inst., Vellayani

8900. Mukherji, S. K., and Bhattacharya, S. K.
A new disease of *Mangifera indica* in India, caused by *Alternaria tenuissima*. *Plant Dis. Reptr*, 1965, 49: 405-7, bibl. 2.

The symptoms are spotting of the twigs, leaves and fruits. The behaviour of the pathogen is described. A few fungicides were tested in the laboratory. Merculin (ethylmercury salicynide) at 1–10 p.p.m. was the most effective, followed by mercurized copper oxychloride at 100–1,000 p.p.m. Copper oxychloride and zineb were also effective at high dosages.

8901. Bhutani, D. K.
Pests that pester your mango crop. *Indian Hort.*, 1964, 9(1): 28.

Life histories and control measures for fruit flies (*Dacus ferrugineus* and *D. zonatus*) and mealy bugs (*Drosicha mangiferae*).

8902. Chadha, K. L., and Singh, K. K.
Fruit drop in mango. IV. Fruit drop and its relation to fruit growth. *Indian J. Hort.*, 1964, 21: 197-200, bibl. 1.

In the investigation described the rate of fruit drop was very high in the initial stages of fruit growth, when development was very rapid, but fell gradually when the fruit reached a substantial size. By 19 May, when Langra and Dusehri fruits had attained 90–95% of their total length and breadth, fruit drop had almost ceased. This stage was not reached until 9 June with Fajri, a late-maturing variety characterized by a longer period of fruit drop. The mathematical relationships of length and diameter with fruit drop are discussed in the light of the figures presented. [For part III see *H.A.*, 35: 4599.]—Fruit Sect., Punjab, Patiala.

8903. Wang, H., Huang, C. C., and Chen, H. S.
A study on the storage and post-harvest treatment of mango fruits. [Chinese, with English summary, 11 lines.] *Rep. Fengshan trop. hort. Exp. Stat., Taiwan*, 32, 1964, pp. 7, bibl. 5, illus.

Mango fruits were treated with hot water (126° F.), Dithane M-22, 1%, Dowicide A or left untreated before storage at 42·8° or 86°. Hot water treatment for 10 minutes gave very good control of anthracnose (*Colletotrichum gloeosporioides*) but neither of the fungicide treatments was more effective than the control. Fruits stored successfully for 30 days at 42·8° and for 9 days at 86°.

Oil palms.

8904. Hartley, C. W. S.
Some notes on the oil palm in Latin Amer
[French and Spanish summaries ⅓ p. eac
Oléagineux, 1965, 20: 359-63, illus.

Suitable climate and soil conditions exist in many p
of Central and South America and new plantings
being undertaken. The prospects of successful cult
tion are particularly good in Colombia and Ecua
The sources of past and present planting materia
described, co-operation between national and comm
cial interests is advocated, particularly in the fiel
plant breeding. The worst pests are *Strategus al*
Rhynchophorus sp., *Alurnus humeralis* and an unspeci
leaf miner. *Calyptocephala marginipennis* has b
identified as a minor pest in Honduras. The se
diseases are red ring and spear and bud rots.

8905. Caldwell, M. A.
Soil sterilization with methyl bromide. *Bo*
1965, No. 7, pp. 19-20, illus.

Oil palm seed planted in soil which had been steri
with methyl bromide 2 days previously showed
phytotoxic effects, and a good rate of germination
obtained.

8906. Poncelet, M.
Plantation de palmiers à huile en terrasses
terrains humides. (**Planting oil palms on mo**
in wet areas.) *Oléagineux*, 1965, 20: 431-2, ill

Young palms do not exhibit asphyxiation symptom
wet, poorly-drained soil when planted on ind
mounds about 80 cm. in diameter and 6–10 cm
height, each with a drainage channel connected to
main system.

8907. Ochs, R.
Contribution à l'étude de la fumure potassique
palmier à huile. (**The potassium fertilizatio**
oil palms.) [English and Spanish summarie
and 4 lines.] *Oléagineux*, 1965, 20: 365-8, 43

Visual observation, foliar diagnosis and soil anal
are the 3 methods of detecting deficiency. In the case
foliar analysis the critical K level is 1% of dry mat
The fact that this is a sufficient but not a necess
condition of deficiency is emphasized, and cases
quoted of multiple deficiencies and the effects
interaction of elements. Soil analysis is said to
relatively simple in respect of oil palms; a signific
correlation was found between the amount of exchan
able K in the soil and the foliar K content. In gene
the critical level of exchangeable K in the soil lies in
range 0·15–0·20 meq./100 g. where the soil has
fixation capacity below 10 meq./100 g. In a fol
diagnostic study of the leaf symptom known as confl
orange spotting no connection was found with
deficiency. The symptom most often observed
palms known to be suffering from K deficiency
described as diffuse discoloration. The intensity of
symptoms lessened when foliar K increased. In
trial in the Ivory Coast during the years 1958-61 hig
significant overall correlations were obtained betw
foliar K content and yield. The hypothesis is
forward that yields are linearly related to foliar K wh
the latter is at or below the critical level. The yields a
foliar K contents of high-yielding and low-yield
palms, some of which had received additional K.
examined to support the hypothesis. It was estima
that improved nutrition corresponding to an incre
of 0·1% foliar K would result in a yield increase

out 10% of the maximum production.—Service
gron., I.R.H.O.

08. Turner, P. D.
Oil palms and *Ganoderma*—is there a problem? *Planter, Kuala Lumpur*, 1965, **41**: 187-9.

he results are given of a survey of the incidence of
anoderma in oil palms 4 to 15 years after planting. At
years the incidence was 44·1% on former coconut
nd, 26·1% on former oil palm land, 0·7% on former
bber land and 0·4% on former jungle.

09. Sánchez Potes, A.
El anillo rojo de la palma africana y del cocotero en Colombia. **(Red ring disease of oil palm and coconut palm in Colombia.)** *Bol. Not., Inst. Fomento algodon. Colombia*, 1964, **4**(10): 3-4, from *Trop. Abstr.*, 1965, **20**, Abstr. n1298.

e disease is much less severe in oil palm plantations
ablished from seed from Central America, where red
g disease occurs, than in those established from seed
m Africa, where the disease is absent. This indicates
at a proportion of the oil palms are resistant.
anters are advised to use only seed from regions
ere the disease has eradicated susceptible palms, to
aintain a high level of management, to destroy all
seased palms and to control the palm weevil.

10. Tuley, P.
How to tap an oil palm. *Niger. Field*, 1965[?], **30**(1): 28-37, illus.

felling, stem tapping or inflorescence tapping.

Papaws.

11. Younge, O. R., and Plucknett, D. L.
Lime, a neglected material for high yields on Hawaiian soils. *Hawaii Fm Sci.*, 1964, **13**(3): 3-4, bibl. 3.

ne at 5,000 lb./acre was applied to a bauxitic silty
y loam with a pH of 5·5, prior to transplanting
paws. Normal fertilizers were also applied to both
ed and control areas. The lime treatment increased
yield of fruit more than 7-fold.—Hawaii agric. Exp.
t.

12. Greening, H. G.
Scalicides for use on papaws in Queensland. *Qd J. agric. Anim. Sci.*,* 1965, **22**: 107-8, bibl. 2.

als on the varieties Hawaiian Solo and Hybrid 5
monstrated that dimethoate (e.c.), malathion (e.c.)
d malathion (d.p.) at strengths of up to 0·15% a.i.
d white oil at 1 : 80 and 1 : 60 could be applied
hout injury to fruit or foliage. From additional
replicated trials it was concluded that the materials
re unlikely to injure the varieties Bettina 100A,
rtus Gold, Guinea Gold and JW×IG, and that
ulsifiable malathion and white oil could safely be
plied to Brookfield 2.

3. Kasinathan, S., Ramakrishnan, S., and Srinivasan, B.
Amino-acids of male and female flowers of papaya. *Curr. Sci.*, 1965, **34**: 211, bibl. 2.

th male and female flowers were found to contain the
e 13 amino acids. Female flowers contained
nificantly more asparagine, arginine and histidine and
alanine and aspartic acid than male flowers.—
waharlal Inst. postgrad. med. Educ. Res. and Dhan-
ntari med. Coll., Pondicherry.

8914. Shigeyama, T., and Murakami, H.
On the quality of papaw fruit and the utilization of unripe fruit in warm regions of Japan. [Japanese, with English summary ¼ p.] *Bull. Fac. Agric. Miyazaki*, 1965, **10**: 295-300, bibl. 7, illus.

Ripe fruit raised in the field had higher moisture and fibre contents but much lower contents of sugar, acid, β-carotene, cryptoxanthin and papain than fruit raised in a greenhouse. Fruit weight decreased with delay in flowering time. Moisture, carbohydrate and fibre contents also tended to decrease. Unripe fruits produced in the field, which were unsuitable for eating owing to delayed harvesting, were successfully processed.

Pineapples.

(*See also* 7254.)

8915. Py, C.
Étude comparée des industries de l'ananas aux îles Hawaï, à Formose, aux Philippines et en Malaysia. III. Philippines. IV. Malaysia. **(Comparative study of the pineapple industries of Hawaii, Formosa, the Philippines and Malaysia. 3. Philippines. 4. Malaysia.)** [English, German, Spanish and Russian summaries ¼ p. each.] *Fruits d'Outre Mer*, 1965, **20**: 141-50, bibl. 11, illus.

Annual production, climate, plant material, culture, harvesting and processing. [For parts 1 and 2 see *H.A.*, 35: 6727.]

8916. Dodson, P. G. C., Stedman, C. J., and I'Ons, R.
Pineapple growing in Swaziland with special reference to production for canning in the Malkerns, Eluyengweni, Ezulwini, Lobamba and Mtilane area in the Swaziland Middleveld. *Bull. Swaziland Dep. Agric.* 12, 1965, pp. 29, illus.

Advice on climate and soils, variety (Smooth Cayenne for canning), planting material, culture (with fertilizer schedules) and economics.

8917. Marr, G. S.
Select the planting material very carefully for better pineapples. *Fmg S. Afr.*, 1965, **41**(3): 21, 23, 26, 29, illus.

Numerous mutant forms and variable characteristics of the Cayenne cultivar are described, together with notes on selection to eliminate undesirable types and to effect improvements.

8918. van Lelyveld, L. J.
Propagation of pineapples.
When and how to plant pineapples. *Fmg S. Afr.*, 1965, **41**(2): 18-19, 22, 25, illus.; and (5): 57, 59, 61-4, illus.

Advice on planting crowns, slips, suckers and stumps of Cayenne, and stumps and suckers of Queen pineapples. [See also *H.A.*, 35: 4620, 4621.]

8919. Peard, R. H.
Soil conservation on pineapple lands. *Fmg S. Afr.*, 1965, **40**(12): 14, 17, 19, illus.

Layout, 2 planting systems (short row or contour planting) and soil conservation measures described.

8920. Haag, H. P., and others.
Estudos sôbre a alimentação mineral do abacaxi (*Ananas sativus*) Sch. **(Studies on the mineral nutrition of pineapple.)** [English summary and tables 1 p.] *An. Esc. sup. Agric. Queiroz*, 1963, **20**: 33-40, bibl. 6, [received 1965].

Formerly *Qd J. agric. Sci.*

In a sand-culture experiment, comprising complete fertilizer and complete fertilizer minus individual minor elements, yield decreased with the different treatments in the following order: complete fertilizer > −Mg > −S > −Ca > −K > −N = −P, the 2 last treatments producing no fruit. The omission of an element from the nutrient solution always caused a considerable reduction in the leaf dry-matter content of that element. The highest citric acid content in the fruit was obtained with the −K treatment and the lowest with −Mg. The highest ash content was given by complete fertilizer and −S, and the lowest by −K. Brix and total sugars were highest with −Ca; with −K total sugars were low and brix lowest.

8921. Wu, Y. C., and Su, N. R.
Response of pineapples growing on a latosol to phosphorus, magnesium and variously applied potassium. [Chinese, with English summary 2 pp.] *J. agric. Ass. China*, 1965, No. 49, pp. 48-64, bibl. 9.

A factorial trial is reported comprising 2 levels each of P and Mg and 3 levels of K. Leaf length, width and number and mean fruit weight were increased by P and K. Magnesium sulphate had no consistent effect on pineapple growth but showed a tendency to increase yields. Potash increased yields and was more effective when applied in 6 doses as top dressings than as a single application. The effect of K was greater in the absence than in the presence of P, and the effect of P was greater in the absence of K or when K was applied as a single basic dressing. In all 12 treatments the mean weight of summer fruits showed a linear relationship to the leaf size index (max. length × max. width) of the plant at the time of floral initiation up to a value of 555 sq. cm. Appreciable increases in fruit weight were not obtained above this level. P, K and Mg applications all increased the percentage of sound fruit produced. [See also *H.A.*, 33: 6252.]

8922. Teiwes, G., and Gruneberg, F.
Role of trace elements in pineapple nutrition. *Plant Food Rev.*, 1965, 5(4): 1-4, and (5): 7-8.

Fe, Mn, Zn, Cu and B.

8923. Cibes, H. R., and Santiago Nieves, A.
BOH: a unique chemical for the induction of flowering in bromeliads. [Spanish summary 7 lines.] *J. Agric. Univ. P.R.*, 1965, **49**: 142-4.

Eighteen species, including *Ananas* spp., were sprayed with 0·06% β-hydroxyethyl hydrazine, and 7 further species, considered more delicate, with a 0·03% solution. Flowering was induced in 20 of the species after times ranging from 7–50 days. None of the controls flowered.

8924. Singleton, V. L.
Chemical and physical development of the pineapple fruit. I. Weight per fruitlet and other physical attributes.
Singleton, V. L., and Gortner, W. A.
Idem. II. Carbohydrate and acid constituents.
Gortner, W. A., and Singleton, V. L.
Idem. III. Nitrogenous and enzyme constituents.
Gortner, W. A.
Idem. IV. Plant pigment constituents. Reprints from *J. Food Sci.*, 1965, **30**: 98-104, bibl. 16; 19-23, bibl. 13; 24-9, bibl. 12; and 30-2, bibl. 6.

Part I: Two lots of pineapple fruit were examined an the period from the end of blooming to fully ripe fru was covered (116 days total, fruit weight from 0·38 4·75 lb.). Weight per eye, fruit weight, volume, c volume and density increased regularly during develo ment. Length : width ratio, proportion of weight shell, core and flesh, relative juice yield and cells p eye were relatively constant over all but the very ea stages of this period. Surface tension, viscosit tendency to foam and maximum ultra violet absorban of the juice appeared to be considerably influenced short-term conditions, possibly sunlight and so moisture. *Part II*: Both spring and summer harves were included. Soluble solids, sucrose, reducing sugar titratable acids, pH, citric acid and alcohol-insolub solids in the flesh showed consistent patterns of chan during fruit development. The soluble solids and p of the shell tissues also related to fruit development, b differed from those in the flesh tissues. By contra malic acid and ascorbic acid appeared to vary in associ tion with short-term weather conditions, not with sta of fruit development. The trends in carbohydrate a acid constituents of pineapple fruit suggest seve discrete physiological stages: pre-maturation; matur tion, beginning about 7 weeks before normal ripene ripening, beginning 2 to 3 weeks before the half-yell stage of ripeness; and senescence. *Part III*: So analyses on shell tissues were included. The fraction N in the flesh of the fruit not precipitated by trichlor acetic acid or by heating fell during the pre-maturati period, then rose during the final weeks of developme By contrast, the concentration of heat-soluble N in t shell fell throughout fruit development. Many of constituent free amino acids in the juice also showed minimum concentration during the middle of t developmental period, or maturation. The notab exception to the N trends was methionine, which w generally absent until the onset of final ripening b present in considerable amounts thereafter. Prote concentration rose during the first weeks after cessati of flowering, then dropped somewhat during t remainder of fruit development. Little or no protea activity was found in the flesh of fruit shortly aft flowering, but the enzyme then appeared abruptly an remained at a high level during fruit developmen dropping only during the final period of ripenin Peroxidase activity was high in the young fruit and fe steadily throughout fruit development, reaching a mi mum during ripening. At this time the activity wa only a third that of the fruit shortly after flowerin The trends in nitrogenous constituents reinforced th earlier suggestion of several discrete physiological stage in the development of the pineapple fruit. *Part I* Chlorophyll in the shell showed little change until fin ripening began. It then disappeared during the final weeks of development. Anthocyanin and chalco compounds in the shell fell off steadily throughout fru development. The carotenoid pigments in the she showed a small downward trend during developmen followed by a small rise during senescence of the fru after the chlorophyll had disappeared. In the flesh however, the carotenoids showed quite marked change These pigments fell until about 7 weeks before ripenes then rose markedly during the final 2-week ripeni period. The trends in plant pigments are consiste with suggestions from earlier studies on nitrogenous carbohydrate and acid constituents of the pineapp uring development, indicating that there are several iscrete physiological stages for the fruit. [From uthors' summaries.]—Pineapple Res. Inst., Honolulu, awaii.

Rubber trees.

(*See also* 8860.)

925. Rubber Research Institute of Malaya.
Green budding: result of a survey of estate experience. *Plant. Bull. R.R.I.M.*, 1965, No. 78, pp. 99-103.

onsiderable die-back occurred in the 1963-64 planting eason in green-budded plants in the early weeks of utting back, which was attributed to exhaustion of the arch reserves of the rootstock. As a consequence a uestionnaire on the practice was sent to about 500 tates and the replies are here reviewed. [For the ethod see *H.A.*, 34: 7767.]

26. Rubber Research Institute of Malaya.
Disodium methylarsonate, a useful herbicide. *Plant. Bull. R.R.I.M.*, 1965, No. 78, pp. 103-4.

table is given, based on field experiments, showing commended rates of application for the control of a umber of grassy weeds. DMA also controlled 2 ecies of fern, infesting hevea plantations. Unlike dium arsenite it did no damage to one-year-old budngs, and can be used for planting-strip maintenance.

27. Jeevaratnam, A. J.
The role of fertilizers in the production of natural rubber. *Trop. Agriculturist*, 1963, **119**: 145-53, bibl. 10, [received 1965].

historical survey is given of the development of rtilizer use in Ceylon and its economic significance, cluding a brief account of current research on the plication of fertilizers to mature rubber. It is noted at only small quantities of NPK are removed from the e during latex production, and that fertilizer applican to mature trees has accordingly been reduced by lf in these trials.

28. Watson, G. A.
Maintenance of soil fertility in the permanent cultivation of *Hevea brasiliensis* in Malaya. *Planter, Kuala Lumpur*, 1965, **41**: 143-50, bibl. 23, illus.

e *H.A.*, 35: 2158.

29. Guha, M. M.
Soils and manuring of rubber in Malaya. *Planter, Kuala Lumpur*, 1965, **41**: 193-9.

escriptions are given and the manurial requirements ted of 6 types of soil.

30. Jeevaratnam, A. J.
Tree damage caused by wind in rubber plantations. *Quart. J. Rubb. Res. Inst. Ceylon*, 1964, **40**: 64-73, bibl. 5.

study of limited data led to the conclusion that losses uld be reduced by improving the anchorage of trees the soil and avoiding gaps in the plantation. Practil suggestions are made on soil conservation, disease ntrol and planting methods and densities.

31. Wastie, R. L.
The occurrence of an *Endogone* type of endotrophic mycorrhiza in *Hevea brasiliensis*. *Trans. Brit. mycol. Soc.*, 1965, **48**: 167-78, bibl. 37, illus.

e universal occurrence of vesicular-arbuscular mycorza in hevea feeding roots is reported. Similarities are shown with infections known, in other hosts, to be caused by *Endogone* spp. Penetration of the root is from external hyphae; the infection develops in the cortex and remains intact until secondary thickening occurs. Hevea seedlings in pots readily become infected with the endophyte from soil and from mycorrhizal rubber roots, but no evidence has been found of either beneficial or harmful effects on their growth. [From author's abstract.]—Rubber Res. Inst. Malaya, Kuala Lumpur.

8932. Figari, A.
Sustancias fenólicas tóxicas al hongo *Dothidella ulei* en hojas de clones de *Hevea brasiliensis*. **(Phenolic substances toxic to the fungus *Dothidella ulei* in the leaves of *Hevea brasiliensis* clones.)** [English summary ¼ p.] *Turrialba*, 1965, **15**: 103-10, bibl. 25.

A substance, probably a flavonol, isolated from leaf extracts of the hevea clone IAN-710, inhibited the germination of conidia of *D. ulei*. Whole extracts of the leaves of this clone were more active than those of GA-1126 against conidial germination. This was completely inhibited by 0·003, 0·006 and 0·01 M chlorogenic acid, caffeic acid or catechol.—Inter-Amer. Inst. agric. Sci., Turrialba, C.R.

8933. Wijewantha, R. T.
Influence of environment on incidence of *Fomes lignosus* in rubber replantations in Ceylon. *Quart. J. Rubb. Res. Inst. Ceylon*, 1964, **40**: 56-63, bibl. 11.

See *H.A.*, 34: 3804.

8934. Rubber Research Institute of Malaya.
Sustained effectiveness of collar protectant dressings. *Plant. Bull. R.R.I.M.*, 1965, No. 78, pp. 107-8.

Trees in an experiment started in December, 1962, have shown the sustained protective value of Fomac 2 for the control of *Fomes lignosus*. [See also *H.A.*, 34: 5820.]

8935. Riggenbach, A.
On the control of the white root disease of the para-rubber tree, *Hevea brasiliensis* Muell. Arg. *Quart. J. Rubb. Res. Inst. Ceylon*, 1964, **40**: 35-55, bibl. 57, illus.

See *H.A.*, 34: 5819.

8936. Rubber Research Institute of Malaya.
Notes on the height of opening budded trees brought late into tapping. *Plant. Bull. R.R.I.M.*, 1965, No. 78, pp. 105-7.

A comparison of high and low opening, the latter being preferred.

8937. Karunaratne, S. W.
Polyphenol oxidase in *Hevea* latex. *Quart. J. Rubb. Res. Inst. Ceylon*, 1964, **40**: 74-7, bibl. 3.

A method is described for isolating the enzyme from latex. The purity of the protein fraction was confirmed by electrophoresis. In a comparison of the effects of 3 inhibitors on the enzyme KCN was less effective than sodium bisulphite, and the latter less effective than sodium diethyl dithiocarbamate.

8938. Dunphy, P. J., and others.
Identification and estimation of tocotrienols in *Hevia* latex. *Nature*, 1965, **207**: 521-2, bibl. 5.

Sugar cane—general.

8939. Humbert, R. P.
The Growing of Sugar Cane. Elsevier Publ. Co., Amsterdam, London, New York, 1963, 9×6 in., pp. xii+710, bibl. 702, illus., map, Dfl. 80, 160s. or DM.89.

After experience in the United States Department of Agriculture and in electron-microscope research and tropical agronomy the author was Chief Agronomist at the Experiment Station of the Hawaiian Sugar Planters' Association for 10 years before becoming Western Director of the American Potash Institute. He deals with sugar cane growing in the major producing areas of the world, but with special emphasis on Hawaii, under the following headings: soil and climatic factors (40 pp.), seed-bed preparation (36 pp.), planting (20 pp.), nutrition (180 pp.), irrigation (80 pp.), drainage (49 pp.), weed control (49 pp.), control of flowering (15 pp.), ripening and maturity (53 pp.), harvesting and transport (34 pp.) and control of pests and diseases (72 pp.). A Spanish summary is provided for each chapter. The importance of crop nutrition, water control (irrigation and drainage) and plant protection (from weeds, pests and diseases) is shown by the fact that these 3 subjects together cover no less than 70% of this volume.

Nutrition, which alone comprises nearly one-third of it, is perhaps the aspect of sugar cane cultivation in which the most rapid advances have been made during the past century. Certainly the situation in most sugar cane areas today bears little resemblance to that in Antigua in 1868 (p. 122) when manure was carried to the fields in baskets on the labourers' heads and scattered at their discretion. The author provides some remarkable figures for increase in consumption of fertilizers; for example, in 1951 the sugar industry in South Africa used 2,135 tons of nitrogen, 6,526 tons of phosphate and (a mere) 842 tons of potash, but 8 years later the figures were 11,324, 5,980 and 12,721 tons, respectively, those for nitrogen and potash representing 5- and 15-fold increases. The chief subjects discussed under nutrition are major elements and trace elements (S, Fe, Mn, B, Cu, Zn, Mo and Al), plant analysis and crop-logging, effect of climate on cane composition, fertilizer application in Hawaii, plant analysis vs. soil tests, placement and ammonia fertilization.

The 272 figures, comprising black-and-white and occasional coloured photographs, graphs and line drawings illustrate every aspect of cane culture and are used effectively to support the text; for example, Figure 37 strikingly demonstrates the benefits of the treatment of seed cane with NPK fertilizer some weeks before planting. A very large proportion of the 702 references relate to Hawaii or the Proceedings of the International Society of Sugar Cane Technologists and there are comparatively few references to papers in languages other than English.

Despite the great advances in fertilization the author has felt it necessary to close his chapter on nutrition with a note of warning by quoting a comment made by some workers in Queensland in 1953 to the effect that the scientific achievements of the past 50 years—the advance of fertilization from an agricultural curiosity to standard farm practice, the gradual improvement in varieties and in the control of pests and diseases and the rise of irrigation as an important source of increased production in some areas—have not been matched by a commensurate general increase in yields. The author adds that proper nutrition of these new varietie improved cultural practices and adequate plant protection hold the key to increased production in the futur His book with its lucid and thorough presentation c these subjects should help to oil the lock. J.D.

8940. British Honduras.
Annual Report of the Sugarcane Officer, Depar
ment of Agriculture, British Honduras, for 196
pp. 32.
Idem. 1963, pp. 20.
Idem. 1964, pp. 15.

The 1962 report gives details of 13 fertilizer trials, variety trials, 2 spacing trials and a trace element tria In 1963 8 fertilizer trials and 4 variety trials are reporte The spacing and trace element trials were continue The 1964 report describes 4 fertilizer trials, 7 variet trials and 2 spacing trials.

8941. Hawaiian Sugar Planters' Association.
Annual Report, October 1, 1963, to September 3
1964, of the Experiment Station of the Hawaiia
Sugar Planters' Association, 1964, pp. 76, illu

Current investigations are reported under the followin headings: *Basic plant physiology and biochemistr* pp. 1-9: Studies on chemical ripening; chemica tested for tassel control; unusual effect of dalapon o cane tissue cultures; evaluating the yield gains due tassel control with diquat; nitrate utilization by ca leaves; uptake of amino acids by sugar cane; N a tillering; effect of increased shade on the quality 50-7209; light requirements for sugar productio and sugar movement; studies on the mechanism flowering; and physiological aspects of yield declin *Climate and related studies*, pp. 10-12. *Mechanic harvesting and related research*, pp. 13-18: Includin experiments with trash removal on a cut-load harveste and evaluation of a pull-type pushback machine, cross-flow cutter and in-field transport. *Nutrition an fertilization research*, pp. 19-25: K needs of 50-7209 relationship of soil K to K up-take; internal N requirements; effect of leaf damage on N up-take; fate o applied N; significance of mineralizable N in the economy of sugar cane; seasonal effect on N level in the leaves and on the growth of young cane; respons of pot-grown cane to Mg; and response of cane to P i relation to level of soil P. *Plant protection researc* pp. 26-36: Rat control; studies on brown spot (*Cercospora longipes*), eye spot (*Helminthosporium sacchari* RSD, leaf scald, Fiji disease, downy mildew (*Sclerospora sacchari*), nematode control by soil fumigatio and various insect pests (leaf roller, beetle borer and new grasshopper). *The varieties programme*, pp. 45-50 Crossing; seedling testing; the variety picture; an selection. *Water studies and irrigation programme* pp. 51-9: Design of sprinkler systems and sprinkle machine developments; sprinkler testing; yield losse due to push-back and plant-back; and studies on small sprinkler and furrow irrigation systems. *Weed contro programme*, pp. 60-7: Screening new chemicals; evaluation of pre-emergence herbicides; new probe unit tested herbicides to be officially registered; special wee problems; and laboratory studies on diuron analysis retention of herbicide sprays on leaves, leaching an soil saturation and adsorption.

8942. Tate and Lyle Central Agricultural Re
search Station, Carapichaima, Trinidad.
Annual Report, 1964, [1965], pp. 368, bibls, illus

rrent research work is reported under the following dings: *Entomology*, pp. 12-120: Field trials and oratory screening of insecticides for froghopper ntrol; evaluation of mineral oil as a solvent for topical plication of insecticides for froghopper control; dies on ovicides and heat treatment for control of ghopper eggs; investigations on oviposition lures and attractants for froghoppers; and biological control estigations. *Agronomy*, pp. 121-278: New varieties; luation of new herbicides; studies on the mineral rition of sugar cane; evaluation of various field, food l pharmaceutical crops; and studies on the relation-ps between rainfall, soil moisture and sugar cane wth. *Plant physiology*, pp. 279-326: Investigations the extraction of gibberellin-like substances from n apical tissue; studies on "bound" gibberellin-like tors; work on gibberellin-like substances in flower ds; and studies on inhibitors and anti-gibberellins sugar cane. *Soil microbiology—plant pathology*, pp. -64: Investigations on the rhizosphere of sugar cane; l experiments with the aseptic growth of sugar cane ues on defined media.

43. Amaratunga, J. L.
Agricultural practices and the progress of sugarcane cultivation in the Gal Oya Valley [Ceylon]. *Indian Sugarcane J.*, 1965, **9**: 127-38, bibl. 11.

tes on soil, fertilizer requirements, drainage, planting hniques, tillering, inter-cultivation and rotation, ntrol of weeds, pests and diseases, reasons for poor lds and economic aspects.

44. Gomes, F. P., and others.
A amostragem da cana-de-açúcar para determinações tecnológicas. **(Sampling sugar cane for technical determinations.)** [English summary 1½ pp.] *An. Esc. sup. Agric. Queiroz*, 1963, **20**: 89-114, bibl. 10, [received 1965].

e sampling method used at the Instituto Agronômico Campinas consists of the collection of one plant or of adjacent canes at a point in the row selected at dom, and is based on the hypothesis that there are at differences between canes of different ages in the ne plant. The method used at the Escola Superior sists of the random selection of 20 canes throughout whole plot, and is based on the hypothesis that iations in the soil within the plot are as important the differences between canes within the plant. en determinations were made on samples of 3 cane ieties of weight per 120 canes, brix, pol, purity and imated sugar percentage by the 2 methods that of Escola Superior was found to be more reliable.

Sugar cane—varieties.

(*See also* 8959.)

45. Anon.
Variedades em Alagoas. **([Cane] varieties in Alagoas.)** *Brasil Açúcar.*, 1964, **64**(4): 6, from *Trop. Abstr.*, 1965, **20**, Abstr. n1381.

ef notes on 4 newly distributed sugar cane varieties, . CB 33-51, CB 45-3, CB 47-15 and IAME 31-17.

46. Rochecouste, E.
Botanical and agricultural characters of sugar cane varieties of Mauritius. 2. M.202/46, M. 93/48, M. 253/48 and Ebène 50/47. *Occ. Pap. Mauritius Sugar Ind. Res. Inst.* **18**, 1964, pp. 19, illus.

nealogy, botanical characters, breeding characters l agronomic features. [For part I see *H.A.*, 32: 3.]

8947. Sturgess, O. W.
Variety trials 1964 season. *Cane Grs' quart. Bull.*, 1965, **28**: 129-34, illus.

Yield data from 12 trials in Queensland are tabulated.

8948. Guerineau, C. M., and Scarsi, M. A.
Variedades de caña de azúcar: su comportamiento en Tucumán (Argentina). **(Sugar cane varieties and their performance in Tucumán, Argentina.)** [English summary ½ p.] *Rev. industr. agríc. Tucumán*, 1960-1964, **42**(2/3): 63-74.

Early, medium and late varieties. [See also *H.A.*, 32: 5706, 33: 1844, 34: 7801-2.]

8949. Anon.
Phil. 54-60 continues to excel in yield. *Bull. VMC Exp. Stat.*, Jan.-Feb. 1965, reprinted in *Sugar News*, 1965, **41**: 212.

The results are tabulated of 7 large-scale variety trials; Phil. 54-60 was tested in 4 and in each case produced the highest yield.

8950. Pan, Y. C., and Liu, T. L.
Field experiments on some new early-maturing sugar cane varieties for early milling. [Chinese, with English summary ¾ p.] *Rep. Taiwan Sugar Exp. Stat.*, 1964, No. 36, pp. 49-57.

For early milling in the year the cane yields from F.148, F.149 and F.144 were, respectively, 23%, 16% and 9% higher than that from N : Co.310, and the sugar yields were 40%, 29% and 21% greater. The late harvest yields were also greater. The performance of F.144, however, was not consistent during the trial.

8951. Mathur, O. P., and Tomar, P. S.
Effect of frost on buds of different sugarcane varieties. *Indian Sugarcane J.*, 1965, **9**: 121-2, bibl. 1.

Significant varietal differences were observed. Co.842 was most frost-resistant, followed by Co.J.46 and Co.L.29. Moderately sensitive varieties were Co.312, Co.1253 and Co.1247. Co.419 and Co.S.245 were highly sensitive.—Reg. agric. Res. Stat., Sriganganagar, Rajasthan.

8952. Tóffano, W. B.
Resistência de variedades ao carvão da cana de açúcar ao inóculo de C.B. 45-3. **(The resistance of sugar cane varieties to smut inoculum from C.B. 45-3.)** *Biológico*, 1965, **31**: 65-6.

Among the 21 varieties tested, the following proved resistant to smut: C.B. 36-24, I.A.C. 55-26, C.B. 45-15, I.A.C. 48-65, I.A.C. 49-131, C.B. 40-69 and Co. 413. In both C.B. 41-76 and Co. 419 sporadic cases of infection occurred. The remaining 12 varieties are classified according to their degree of susceptibility.

8953. Teotia, T. P. S., and Rajani, V. G.
Evaluation of varietal resistance or susceptibility to various sugarcane pests in Uttar Pradesh.—Parts I and II. *Indian Sugar*, 1965, **14**: 677-9; and 735-41, bibl. 25.

Part I: The literature on 8 insect pests and mites is briefly reviewed. *Part II*: The relative resistance of numerous varieties to various pests is tabulated, including percentage losses in cane and sugar.

8954. Agarwal, R. A.
Resistance in sugarcane varieties to Eriophyid mite (*Aceria* sp.). *Indian Sugarcane J.*, 1965, **9**: 108-10, bibl. 3.

In a survey of 212 varieties it was noted that, in general, *S. officinarum*, *S. spontaneum* and *Erianthus* spp. were either free from attack, highly resistant or resistant. Heavily attacked varieties included Co.285, Co.331, Co.997, Co.1150, Co.1266 and Co.1269. The varieties Co.443, Co.664, Co.992, Co.1167 and Co.1268 were free. There were indications that resistance was a heritable character.—Sugarcane Sub-Stat., Yamunanagar, Punjab.

Sugar cane—setts, planting and moisture relations.

(*See also* 8987.)

8955. Pao, T.-P., and Hung, S.-L.
Studies on the multiplication of seed-cane in spring nurseries using top cuttings. II. [Chinese, with English summary 1 p.] *Rep. Taiwan Sugar Exp. Stat.*, 1964, No. 36, pp. 1-16, bibl. 7.

Setts were treated with hot water (50° C. for 2 hours) and hot air (54° for 8 hours), and studies were made of the effects on germination, viability and the number of rooted setts/ha. obtained. The setts used comprised immature stalk and blossoming stalk with lateral sprouts; neither was adversely affected by the treatments. No significant differences were observed in the yield of rooted setts for planting from the nursery. Hot-air treatment of immature setts resulted in a significantly greater germination percentage than hot-water treatment. The viability of blossoming setts with lateral sprouts shorter than the wrapped sheath was adversely affected by hot-air treatment. [For part I see *H.A.*, 34: 5858.]

8956. Thompson, G. D., and Halse, C. G.
Some notes on sugarcane planting procedures. *Proc. 38th annu. Congr. S. Afr. Sugar Tech. 1964*, 1964, pp. 154-64, bibl. 6.

Experiments were conducted during 1958-1960 to study the effects of various factors on the germination of sugar cane setts in 3 different climatic areas each having a different soil type. The procedure followed was to harvest generally at 3-monthly intervals and to replant immediately so that 4 seasonal sets of data were obtained per annum. Rainfall data for the individual sites and average temperature data for a single reference site have been included in the results. General conclusions reached were that mercurial fungicide improved germination sufficiently to warrant the treatment at all sites in all seasons; that removal of closely adhering trash was not warranted; that setts having 5 eyes should be planted; that soil cover over the setts should be between 2 and 4 in.; and that setts from young parts of the cane stalk should be preferred. [From authors' summary.]

8957. Chang, J. C. C., and Shiue, Y. S.
Studies on the culture of sugar cane on the Taiwan Sugar Corporation plantation. I. Comparative experiment on different planting times for plant and ratoon cane, and comparative experiment on the use of fallowing on cane plantation land. [Chinese, with English summary 1 p.] *Rep. Taiwan Sugar Exp. Stat.*, 1964, No. 36, pp. 59-70, bibl. 11.

Yields of plant cane were greater from autumn-planted than from spring-planted cane, whereas yields of second and third ratoon cane were significantly higher from spring planting. The first ratoon crop showed no significant difference. The combined yields of plant cane plus first ratoon cane were higher with autumn planting, but other cumulative yields showed no significant differences. However, for similar lengt growing period, spring planting was best for the cane plus first ratoon yields. Costs are also consid Soybeans in spring and a green manure crop in sum is the most profitable form of land utilization durin fallow period of autumn-planted cane.

8958. Chen, W. T., and Pao, T. P.
Experiments on cultural methods for spring p sugar cane. [Chinese, with English summ 1¼ pp.] *Rep. Taiwan Sugar Exp. Stat.*, 1 No. 36, pp. 31-47, bibl. 13.

The best time for interplanting sugar cane in sp paddy fields was found to be 5 days after transplan the rice seedlings. There was no statistical differ between yields from the flooded (oblique) and low (horizontal) methods of planting. The flooded met was more economic. A cane row width of 72 cm. economically desirable, and the optimum dista between setts was 0·2–0·4 m. Yields of cane and s from top setts were, respectively, 19% and 18% hig than those from stalk 2-bud bedded setts. Of 9 va ties tested H.37-7202 was most suitable as a sp paddy crop because of high yield, sugar content wind resistance.

8959. Ferraris, I. P., Porter, R. J., Jr., and Esco T. R.
Production and quality of seven sugarcane vari in relation to month of planting and harvesting *Sugar News*, 1965, **41**: 260-9, 275.

The varieties studied were F.140, Q.57, B.37172, B.4 H.P.49-17, H.49-5 and P.O.J. 3016. Regardless variety and planting month, the sugar yield obta from plants aged 15 months was significantly hig than from those of 11, 12 and 13 months. Ca planted in August, September, October, January, M and June produced the highest yields (158·96–177 piculs/ha.) regardless of variety and planting a B.37172 was the highest yielder for any given plant or harvesting time. Significant interactions were fou between any 2 of the 3 factors: variety, planting mo and harvesting age; different recommendations therefore made for each variety with the exception Q.57, for which no seasonal pattern emerged.—Victor Milling Co. Inc., Philippines.

8960. Misra, G. N., and Kar, K.
Comparative response of sugarcane to differe methods of planting cane under Uttar Prad conditions. *Indian Sugarcane J.*, 1965, **9**: 86- bibl. 2.

The results of experiments carried out between 1932 a 1954 on the comparative merits of flat and trench pla ing are presented. It is deduced that in dry conditio flat planting proved better than trench planting f normal cultivation, whereas the reverse was true intensive cultivation. In more humid conditions with good irrigation the trench method was bett Germination was higher with trench planting provid adequate soil moisture was available. At one static for 2 out of 3 seasons the yield of cane from the rato crop of trench-planted cane was significantly high than that from the flat-planted crop.—Sugarcane Re Stat., Shahjahanpur, U.P.

8961. Anon.
Sugar cane planting methods. *Publ. misc. Esta exp. agríc. Tucumán*, 1964, No. 15, pp. 9-13, fro *Trop. Abstr.*, 1965, **20**, Abstr. n1593.

ials with several varieties plant and first-ratoon cane ds fell with increase of row spacing from 1·2 to 1·8 and the second ratoon gave the highest cane yield 5 m. Sugar content was highest with plant cane at m. and with the second ratoon at 1·2 m., and was same at all spacings with the first ratoon. The ber of stalks per unit row length increased with ing in plant and second ratoon cane.

2. TANG, K. H., AND HO, F. W.
Effect of density of planting on the yield of autumn plant cane and its first ratoon. [Chinese, with English summary 1 p.] *Rep. Taiwan Sugar Exp. Stat.*, 1964, No. 36, pp. 17-30, bibl. 19.

sities of approximately 15,000, 19,000, 26,000 and 00 setts/ha. were tested. The number of tillers per initially increased with the number of cuttings but differences had disappeared after 6 months. Both he plant cane and the ratoon differences in the nber of millable stalks and in cane yields were not ificant.

3. TSE, C. C., AND CHU, J. M.
Study on the spacing of the new sugar cane variety F. 146. [Chinese, with English summary ¾ p.] *Rep. Taiwan Sugar Exp. Stat.*, 1964, No. 36, pp. 71-81, bibl. 20.

optimum number of cuttings of F. 146 per ha. in dy loam or loam soil was considered to be 24,000. cing between plants was more important than veen rows; 0·3 m. between plants was found best 1·25 m. or more between rows. In the spacing s NPK was applied at 2 levels and the yields of both t and ratoon cane were improved by the higher . The germination percentage of F. 146 ratoon was not better than that of N : Co.310.

4. VICTORIAS MILLING CO. INC.
The effect of system and rate of planting on the yields of five cane varieties planted on Guimbalaon clay soil. *Bull. Victorias Milling Co. Inc. Exp. Stat.*, 1964, **11**(8-9): 4-5, from *Trop. Abstr.*, 1965, **20**, Abstr. n1385.

experiment in the Philippines showed that planting cted setts at 30–40,000 per ha. gives better results planting unselected setts at higher rates.

5. ANON.
Delta district cooperators mechanize sugarcane planting. *Soil Conserv.*, 1965, **30**: 233, illus.

achine is briefly described which can plant 12 acres day with the aid of 5 men, 2 tractors and 3 small ons.

6. HILL, J. N. S., AND SUMNER, M. E.
A preliminary report on water availability in some Natal sugar belt soils. *Proc. 38th annu. Congr. S. Afr. Sugar Tech. 1964*, 1964, pp. 114-18, bibl. 6.

departure of actual evapotranspiration from poten- evapotranspiration of sugar cane plants growing in l. drums containing 6 different soil series is indicated ifferent soil moisture contents and under varying orological conditions. [From authors' summary.] illary conductivities of the 2 texturally extreme soil s were determined; the relationship between llary conductivity and available moisture is pre- ed in graph form.—Tongaat Sugar Co. Ltd, and v. Natal.

8967. HILL, J. N. S., AND SUMNER, M. E.
The estimation of runoff from high pressure spray irrigation in sugarcane fields on the coast of Natal. *Proc. 38th annu. Congr. S. Afr. Sugar Tech. 1964*, 1964, pp. 119-20, bibl. 4.

Run-off was measured with portable lysimeters. A multiple regression analysis was carried out on data relating to run-off, soil compaction, slope and the presence or absence of a trash blanket, and it was found that compaction alone had a highly significant effect on run-off. Remedial measures involved conversion to low pressure equipment where possible and inter-row sub-soiling of ratoons after harvesting. The latter measure was found to be effective for 8 months or more. —Tongaat Sugar Co. Ltd, and Univ. Natal.

8968. HILL, J. N. S., AND SUMNER, M. E.
The infiltration capacities and percolation rates for some Natal sugar belt soils. *Proc. 38th annu. Congr. S. Afr. Sugar Tech. 1964*, 1964, pp. 121-3, bibl. 2.

Mean data are presented for the 10 soils studied. During the 12-month period of the study temperature was found to have no significant influence on the results. As the antecedent soil moisture content increased the infiltration capacity was reduced. Compaction was found to be the most important factor influencing infiltration. It is suggested that infiltration studies may be used to determine the general physical condition of a given soil.—Tongaat Sugar Co. Ltd, and Univ. Natal.

Sugar cane—weed control and trash handling.

8969. GILL, H. S., SINGH, S., AND SIDHU, B. S.
Chemical control of weeds in sugarcane. *Indian Sugarcane J.*, 1965, **9**: 95-100, bibl. 10.

The herbicides tested included 2,4-D (Na salt), Nata (TCA Na salt), Karmex, Santobrite, Planotox and Telvar. In pre-emergence tests 2,4-D at 3 lb. a.e./acre effectively suppressed *Cyperus rotundus* and broad-leaved weeds. The effect was more persistent when combined with a post-emergence spray at the same rate. Telvar and Karmex at 5 lb./acre checked broad-leaved weeds; Nata and Planotox were ineffective. Differences in germination, growth, tiller production and yield were not significant although Planotox reduced germination and Karmex favourably influenced cane yield. In post-emergence tests 2,4-D at 3 or 5 lb. a.e./acre (in split doses) increased the yield significantly. *Cynodon dactylon* and *Boerhaavia diffusa* proved resistant to 2,4-D. Nata at 20 lb./acre affected cane growth and yield adversely. Trash mulching, tested in one season only, resulted in the highest yield.—Sugarcane Res. Stat., Jullundur, Punjab.

8970. MATHUR, P. S., AND KAR, K.
Further weed control trials in sugarcane crop at Shahjahanpur. *Indian Sugarcane J.*, 1965, **9**: 101-4, bibl. 2.

Nata (TCA Na salt) at 5·6, 11·2 and 16·8 kg./ha. in combination with 2,4-D did not control weeds effectively; the higher doses damaged the crop and the final yield was less than from unweeded plots. Dalapon (Na salt) at 5·6 kg./ha. as a pre-emergence or as a post-emergence application, alone or in combination with pre-emergence sprays of 2,4-D or 2,4-D plus Nata, was not effective. Simazine used as a post-emergence spray at 4·48 and 8·96 kg./ha. was not effective unless combined with a pre-emergence treatment, in which case the lower dose was sufficient. It had no adverse effect on the crop (var. Co.S.510) and only slightly increased the yield over the normally cultivated control plots.—Sugarcane Res. Stat., Shahjahanpur, U.P.

8971. Rochecouste, E.
Compte rendu d'une mission d'étude sur le désherbage de la canne à sucre à Madagascar. **(Report of a study visit on weed control in sugar cane in Madagascar.)** *Agron. trop., Paris*, 1965, **20**: 262-4.

The main herbicides used are TCA and a heavy ester of 2,4-D. It is recommended that the latter be replaced by a 2,4-D amine during the warm season to prevent toxic vapours from reaching neighbouring crops. The amine at 3 kg./ha., or MCPA, should be used in preference to the ester in young cane 6–8 weeks old. *Cyperus rotundus* should be sprayed with 2,4-D ester or amine immediately after planting cane setts. Karmex [diuron] at 4–5 kg./ha. or a triazine compound is recommended for weeds resistant to phytohormones. It is suggested that *Echinochloa pyramidalis* on canal banks be replaced by *Imperata cylindrica* or similar grasses easily controlled by dalapon or TCA. In the humid east coast region Karmex is recommended throughout, except on young cane, with additional 2,4-D, TCA and Na chlorate where necessary. The conditions in which Karmex may damage sugar cane are described.—Mauritius Sugar Ind. Res. Inst.

8972. South African Sugar Association Experiment Station.
Herbicides—recommendations for their use in plant cane or burnt ratoon. *S. Afr. Sugar J.*, 1965, **49**: 544-51, illus.

Recommendations based on the results of recent trials include 2,4-D and MCPA for pre-emergence and early post-emergence application, 2,4-D amine for the short-term control of most broad-leaved weeds, and paraquat and bromacil for watergrass control. Rates of application are given for bromacil on light sandy, medium and heavy soils. Diuron may replace bromacil under moist conditions provided watergrass is not present.

8973. Gosnell, J. M., and Thompson, G. D.
The results of herbicide trials, 1963-64. *Proc. 38th annu. Congr. S. Afr. Sugar Tech. 1964*, 1964, pp. 166-74, bibl. 4, illus.

In a general herbicide trial taken through to sugar cane harvest no significant reduction in cane yield was caused by paraquat; in fact, increasing levels of paraquat produced increasing yields of cane. Diquat was inferior to paraquat, and of the pre-emergent herbicides, DCMU was the best. In another dryland trial no pre-emergent treatment was successful, but in an irrigated trial atrazine and simazine were successful, and DCMU was also good. Of the post-emergent treatments bromacil at 1½ and 2 lb. per acre was very successful in the control of weeds but caused damage to the cane. At a lower rate (⅔–1⅓ lb. per acre) in combination with paraquat, weed control was also excellent and the damage to cane was less. DCMU plus paraquat was also successful under moist conditions. Paraquat at ⅔ to 1 pint per acre gave excellent short-period control of dense *Cyperus esculentus*, being equivalent to and cheaper than hand weeding. Dalapon at 15 lb. gave good all round control of grasses in drainage ditches for 4 months and Garlon (dalapon+2,4,5-TP) at 16 gave total control of *Phragmites* reed for at le months. [Authors' summary.]

8974. Aurelio, C. G., Jr.
Alternatives in weed control. *Sugarcane Bull.*, Jan.-Feb. [?1965], reprinted in *Sugar* 1965, **41**: 194, 196, 198, 200, bibl. 3.

Weed control experiments and common weeds i Philippines are reviewed. Good results have obtained with Karmex at 3 kg./ha.

8975. Orsenigo, J. R., and Casselman, T. W.
Application of dalapon in Florida sugar *Biokemia*, 1965, No. 7, pp. 21-3, illus.

A shield-sprayer for applying herbicides to grass in sugar cane rows is described; it comprises a fle mounted sheet-metal shield and 3 swivel-mou nozzles. Several such units may be joined side by and mounted on a tractor. In yield trials with variety Cl.41-223 the control of grasses with dal using this device was commercially acceptable, cane tolerance was good (at least 92%) and the tre plots yielded slightly more cane and sugar per acre the hand-weeded control.—Everglades Exp. Belle Glade, Fla.

8976. Verma, S. S., and Lamba, P. S.
Effectiveness of 2,4-D in different concentra and time of its application on weed contro development of sugarcane. *Indian J. Ag* 1964, **9**: 292-6, bibl. 13.

Of 19 species of weed infesting the crop, only *Port oleracea*, *Cynodon dactylon* and *Saccharum sponta* were resistant to 2,4-D applied at 1, 2 or 3 lb./acre pre-emergence application and at 2, 4 and 8 weeks emergence. Optimum weed control was obtained the first 2 sprays only, at 1 and 2 lb./acre; this also h beneficial effect on cane yield, sucrose content purity. During a 3-year period cane height, weigh clump, yield per plot and percentage of juice favourably influenced by the herbicide treatmen Inst. Plant Ind., Indore.

8977. Lopez, M. E., and Barile, R. L.
The effect of different herbicides in the contr ***Aeginetia indica*** **Roxb.** *PSI Quart*,. March 1 reprinted in *Sugar News*, 1965, **41**: 71-83, bibl. 11.

A field trial of 5 herbicides for the control of *Aegi* *indica* is described. The highest yields of sugar per were obtained after using a mixture of 2 l. of 2,4-D 2 kg. of sodium TCA per ha., followed closely by 2·5 Karmex per ha.

8978. Rajamanickam, D., and Ekambaram, C.
Trash mulch in cane culture at Cuddal *Indian Sugar*, 1965, **14**: 751-6, bibl. 7.

Little difference in tillering due to trash mulching noticed. The incidence of early shoot borer in tr mulched plots was significantly lower than in non-tr mulched plots. There was much less weed growth fewer man hours were required for weeding in tr mulched plots. The final cane population was hig in trash mulched plots. The weight and length of c were slightly better in trash mulched plots, resulting 3 tons per acre more cane. A 10-day irrigat interval seemed to be sufficient to obtain optim yields in trash mulched plots, whereas a 5-day irrigat interval was essential to obtain optimum yields in n sh mulched plots. [From authors' summary and nclusions.]

9. Samuels, G., González-Tejera, E., and Alers-Alers, S.
The handling of sugarcane trash in the humid areas of Puerto Rico. [Spanish summary ⅔ p.] *J. Agric. Univ. P.R.*, 1965, **49**: 76-87, bibl. 8.

e treatments applied to 17 consecutive crops (3 plant e and 14 ratoons) consisted of burying the trash, ning it, and aligning it in alternate rows. Burning trash reduced the cane and sugar yields, after 7 years nificantly so, compared with aligning it; burying it d an intermediate effect on yields. The sucrose ntent of the cane was not affected by the treatments. en a new crop was planted on ploughed land where sh had been burned for years, yields were similar hose where trash was aligned, but the reduced yields ociated with burning returned earlier in the ratoons each new cycle. The temporary yield increases are cussed in relation to soil aeration and organic matter ntent.

Sugar cane—soils, root spread and nutrition.

0. Shiue, J. J.
A study on the silicon content in the soil of Taiwan sugar cane fields. [Chinese, with English summary ½ p.] *Rep. Taiwan Sugar Exp. Stat.*, 1964, No. 36, pp. 109-16, bibl. 13.

thods of determining the soluble SiO_2 content and relationship between SiO_2 content and various soil racters are discussed. It was noted that soils with a soluble SiO_2 content generally gave low cane yields.

1. Wood, G. H.
Preliminary report on the root spread in sugar cane as revealed by radioisotopes. *Proc. 38th annu. Congr. S. Afr. Sugar Tech. 1964*, 1964, pp. 134-42.

order to study the root spread of N : Co.376, radiosphorus in solution was injected into the soil at ious distances, positions and depths in relation to the e row. (Cane planted 3 October, 1962.) Uptake he plant was estimated by sampling the middle 12 in. he 3rd leaf lamina. P^{32} distribution throughout the nt was found to be similar though initially not ntical to total phosphate distribution, becoming more rly similar with the passage of time. The feeding ts were found to be concentrated mainly beneath the ol with no such roots at lateral distances (6-in. depth) ater than about 4 ft. from the centre of the row. The hest concentration of roots to the side of the stool found to be at the 3-in. depth. It was also found the plant takes up phosphate strictly in proportion ts growth and that the highest phosphate uptake ing the year (25 February, 1963–25 February, 1964) in the period 25 February, 1963, to about 25 April, 3, and again during the beginning of 1964. There a slow but steady uptake during winter and spring. om author's summary.]

2. Yates, R. A.
Calibration of soil and leaf analyses for the control of sugar-cane fertilization rates in southern Queensland. *Aust. J. agric. Res.*, 1965, **16**: 367-84, bibl. 27.

a from a large series of trials over a number of rent soil types have been studied to determine the e of leaf and soil analyses for controlling the fertiion of sugar cane. Statistical data on the correlations obtained are presented. The response to N fertilizer could not be assessed from leaf analysis data, but the level of mineral N in incubated top-soil was well correlated with the amount of fertilizer required. The response to phosphate fertilizer could be assessed through soil, leaf or juice phosphate analyses, the leaf analysis being the most accurate, with a critical value of 0·18% P in the dry lamina of the top visible dewlap leaf. The reliability of this assessment depended on the soil Ca/Mg ratio being normal, and there being no trace element interaction. The response to K fertilizer was only poorly correlated with soil K. The correlation with leaf K was good, and was modified by the response of leaf K to K fertilizer and by the level of phosphate in the leaf. At 0·174% P, the critical level for leaf K was 1·69%; this fell to 1·44% at 0·22% P. Assessment of critical values in leaf tissue was complicated by difficulties in selecting sampling times due to very variable growth rates, and by associated variations in leaf analyses. The levels of Ca and Mg have not been found to affect the critical levels of K. [Author's summary.]—Fairymead Sugar Co. Ltd, Bundaberg, Qd.

8983. Golden, L. E., and Ricaud, R.
Foliar analysis of sugar cane in Louisiana. *Bull. La agric. Exp. Stat.* **588**, 1965, pp. 23, bibl. 35.

The factors governing the N, P and K contents of leaf blades were investigated. The differences in leaf nutrient contents caused by soil type or location were often as great as or greater than those caused by fertilizer treatment. Fertilization with N, P or K generally increased leaf-blade N, P or K. With P and K the available P and K contents of the soil and the depth of root development affected the response. There were highly significant varietal differences in leaf-blade N, P and K. Contents were influenced by significant interactions involving almost all the variables studied, viz. year, soil type, variety, age, time of sampling, prior rainfall, fertilizer treatment and yield. It is concluded that leaf-blade analysis is not alone sufficient as a guide for fertilizer application but may be useful in special cases. [See also *H.A.*, 34: 3843.]

8984. Sen, S. C.
Formulation of a manurial schedule for sugarcane crop at Kanpur—N.P.K. fertilization. *Indian Sugar*, 1965, **14**: 689-90, bibl. 2.

In factorial trials on the variety Co.453, N (224 kg. N/ha.) and P (112 kg. P_2O_5/ha.) increased both cane yield and estimated sugar per acre. The response to K (134 kg. K_2O/ha.) and to the interactions N×P, P×K, N×K and N×P×K were not significant. N had the maximum beneficial effect on pol percent juice.

8985. Ghouse, L. M., Ranganathan, V., and Radhakrishnan, T.
Studies on the nitrogen index. 1. Preliminary studies on the evaluation of method of controlling nitrogen manuring. *Indian Sugar*, 1965, **15**: 87-92, bibl. 11.

Graded doses of up to 350 lb. N/acre were applied to the sugar cane varieties Co.419 and Co.449 in 2 equal parts, one at 45 and one at 90 days after planting. Leaf samples were collected just before each application and 45 days after completion. The percentages of foliar N are tabulated with crop yield and quality figures. The decreases in foliar N due to age and to growth rates were not separable. High correlation coefficients existed between the final yield and the foliar N at 4½ months, and also between the foliar N content and the total N received by the crop at both 3 and 4½ months. The optimum economic N dose appeared to be 200–250 lb./acre, corresponding to 1·9–2% foliar N at 4½ months. Regression equations are presented for calculating N availability for each variety studied at 3 or 4½ months.—Cent. Sugarcane Res. Stat., Cuddalore, N.T.

8986. Wood, R. A.
Assessing the potential of sugar belt soils to supply nitrogen for plant cane. *Proc. 38th annu. Congr. S. Afr. Sugar Tech. 1964*, 1964, pp. 176-9, bibl. 15.

The results are reported of laboratory incubation studies carried out on the main soil groups within the Sugar Belt, in order to determine their potential to mineralize N after ploughing out cane. Marked variation in mineralizing capacity was shown, ranging from 200–650 lb. sulphate of ammonia per acre equivalent over a 2-week incubation, the magnitude of the release being broadly related to increase in soil organic carbon content. In most soils the major release of mineralizable N occurred during the first 2 weeks of incubation. A marked delay in nitrification was noted in the more acid soil groups. It was established that the magnitude of mineral N release for any of the soil groups was directly correlated with the length of time the soil was allowed to remain air dry before being re-wetted. The results are discussed in relation to the time of ploughing and replanting, and the incubation technique is suggested as a possible procedure for assessing N fertilizer requirements of plant cane. [Author's summary.]

8987. Nath, A., and Mathur, B. K.
Time of manuring ratoon under deficient irrigation conditions. *Indian Sugar*, 1965, **14**: 803-4, bibl. 7.

In a 3-year study of pre-monsoon irrigation and N fertilization of ratoon crops it was established that 3 irrigations and the application of fertilizer in a single dose before the rains resulted in the greatest yield with respect to both quality and quantity, and that even a single pre-monsoon irrigation significantly improved the yield compared with the control. The application of the full dose of fertilizer at the time of the single irrigation had no adverse effect.—Main Sugarcane Res. Stat., Shahjahanpur.

8988. Parish, D. H.
The amino-acids of sugar cane. I. The amino-acids of cane-juice and the effect of nitrogenous fertilisation on the levels of these substances. *J. Sci. Food Agric.*, 1965, **16**: 240-2, bibl. 9.

Twenty-three amino acids have been detected in cane juice, pipecolic acid, methionine, tryptophan and β-alanine for the first time, and the presence of a hydroxypipecolic acid is suggested; the presence of arginine is confirmed. Increasing the supply of N increases markedly the amides asparagine and glutamine and less markedly the basic amino acids lysine, histidine, arginine and tryptophan. The neutral and acidic amino acids tend to increase and then decrease in level with increasing N supply. [Author's abstract.]—Sugar Res. Inst., Réduit, Mauritius.

8989. Srivastava, S. C.
New dimensions of research on phosphate nutrition of sugarcane in India. *Indian Sugarcane J.*, 1965, **9**: 92-4, bibl. 23.

A brief review of relevant research in the fields of agronomy, physiology and soil chemistry.

8990. Dabin, B.
Étude des formes du phosphore dans quelques sols des Antilles. Action sur l'alimentation phosphatée de la canne à sucre. **(Study on the forms of phosphorus in some soils in the Antilles. Effect on phosphate nutrition of sugar cane.)** *Cah. O.R.S.T.O.M., Pédol.*, 1964, **2**(2): 5-12, bibl. 8, from *Trop. Abstr.*, 1965, **20**, Abstr. n1603.

Sugar cane responded well to superphosphate and lime on ferrallitic and allophane soils containing less than 65 p.p.m. Ca and Al phosphates, but did not respond to P on calcic montmorillonite soils containing about 200 p.p.m. Ca phosphate. Fe phosphate in the soil contributed little to the phosphate requirements of the crop. Al phosphate resembled Ca phosphate in its relatively high availability to the plant.

8991. Yang, T.-T.
Relationship between the growth of the sugar cane plant and the absorption of K and Na. [Chinese, with English summary ¾ p.] *Rep. Taiwan Sugar Exp. Stat.*, 1964, No. 36, pp. 101-7, bibl. 12.

Different amounts of K and Na were added to nutrient solutions supplied to water-cultured plants of the variety N : Co.310. Lack of K had a markedly adverse effect on the height and diameter of the main stalk, on the number of tillers and on the dry matter content. Lack of Na had little or no effect. The K content was high in shoots and low in roots; the reverse was true of Na, which was not easily accumulated. Deficiency symptoms appeared when the K content of the +1 leaf was 0·79% and disappeared at the 1·22% level. At 1·8% the plants grew well. The amount of K+Na absorbed was 45–60 me./kg. of fresh roots. The K absorption capacity of roots depended on the age and portion of the root and on the concentration of the nutrient solution.

8992. Bishop, R. T.
Stalk sodium: a useful guide in investigating problems of plant nutrition. *Proc. 38th annu. Congr. S. Afr. Sugar Tech. 1964*, 1964, pp. 126-32, bibl. 5.

The presence of Na in the stalk of sugar cane is shown to be significantly correlated with adequate soil moisture and, if no other growth factors are limiting, stalk elongation. The presence of Na is also shown to be related to optimum N, P and K content of the stalk and its value as a guide to determining, reliably, different levels of soil fertility is considered. [Author's summary.]

8993. de Bittencourt, V. C., and others.
A absorção de ferro pela cana de açúcar, Co 419, em função de idade. **(Absorption of iron by Co.419 sugar cane in relation to age.)** [English summary 10 lines.] *An. Esc. sup. Agric. Queiroz*, 1963, **20**: 139-45, bibl. 7, [received 1965].

The authors present figures for concentration (p.p.m. Fe in dry matter) in the stem and leaves of samples taken monthly from cane aged 7–15 months and others from which, with the aid of data previously presented [*H.A.*, 33: 8282], the Fe content per ton fresh weight can be calculated.

8994. Tomar, P. S., Mathur, O. P., and Oberai, D. S.
Iron deficiency in ratoon crop of sugarcane in canal irrigated soils of Rajasthan. *Indian Sugarcane J.*, 1965, **9**: 123, bibl. 5.

A ratoon crop exhibiting chlorosis symptoms in a soil of pH 8 was treated with foliar sprays of 1, 2 and 3%

ferrous sulphate, 1·5% urea or a top dressing of urea at 30 kg. N/ha. Complete recovery was induced by one spray of 3% Fe SO_4 or 2 sprays of 2% Fe SO_4 with a 2-week interval. Urea was not effective.—Reg. agric. Res. Stat., Sriganganagar, Rajasthan.

8995. Chapman, L. S.
Fertilizer burn. *Cane Grs' quart. Bull.*, 1965, **28**: 140-2.

A brief review of experiments showing the adverse effects on germination of placing fertilizer too close to the setts.

8996. Fogliata, F. A., and Aso, P. J.
Efectos de la cachaza sobre las características químicas y microbiológicas de los suelos cultivados con caña de azúcar. Resultados preliminares. **(Effects of filter-press cake on the chemical and microbiological characteristics of sugar cane soils. Preliminary results.)** [English summary 1 p.] *Rev. industr. agríc. Tucumán*, 1960-1964, **42**(2/3): 37-61, bibl. 22.

Sugar cane—disorders, diseases and pests.

(*See also* 8952-8954.)

8997. Roth, G., and Whitehead, C.
The biological background to cane diseases. Idem. (2) Constitutional diseases. *S. Afr. Sugar J.*, 1965, **49**: 331, 333, illus.; 469-75, illus.

The first article briefly reviews the nature of bacterial, fungus and virus diseases. Part 2 deals with factors causing non-infectious maladies including environmental conditions (moisture stress, temperature and water-logging) nutritional imbalance, genetic effects, the use of unsuitable planting material and poor management.

8998. Sturgess, O. W.
A revised approach to chlorotic streak. *Cane Grs' quart. Bull.*, 1965, **28**: 135-7, illus.

Research on the disease is briefly reviewed. The importance of water in the spread and development of chlorotic streak is stressed; control measures are suggested involving improved drainage, bare fallowing or cover-cropping of diseased land for 12 months, destruction of cane volunteers and several species of grass, and the selection of healthy setts.

8999. Vázquez de Ramallo, N. E.
La enfermedad del "leaf scald" en caña de azúcar. Su determinación en Tucumán (Argentina). **(Sugar cane leaf scald disease: its determination in Tucumán.)** *Rev. industr. agríc. Tucumán*, 1960-1964, **42**(2/3): 23-8, bibl. 12, illus.

Including short notes on varietal resistance to leaf scald (*Xanthomonas albilineans*), injuries and control.

9000. Zabala, S., Vázquez de Ramallo, N. E.
Las enfermedades de la caña de azúcar en Tucumán. **(Sugar cane diseases in Tucumán.)** *Rev. industr. agríc. Tucumán*, 1960-1964, **42**(2/3): 1-22, bibl. 31, illus.

Fungal diseases of the stem, leaf and root, and damping-off.

9001. Manocha, M. S., and Vasudeva, R. S.
Factors affecting the pathogenicity of *Colletotrichum falcatum* Went, causing red rot of sugarcane. *Indian J. agric. Sci.*, 1964, **34**: 264-72, bibl. 13.

Studies were made of the effects of various nutritional and enzyme treatments of isolates of the light, virulent strain and the dark, weakly pathogenic strain of the fungus. The addition of an organic or inorganic N source (except for nitrite) to the inoculum of the isolates increased the linear spread of the infection. Of 15 different amino acids, asparagin, argenine, valine and leucine increased the virulence of both isolates whereas tyrosine and phenylalanine inhibited it. Vitamins of the B complex and NAA, IBA and CPA had no significant effects on virulence. High concentrations of cane juice caused a decline in growth and spore germination in the dark isolate, the effect being less marked with the light isolate. Pectinase and sucrase activities were greater in the light isolate; the addition of a N source stimulated enzyme activity in both isolates.—Indian agric. Res. Inst., New Delhi.

9002. Singh, R. K., Srivastava, R. N. P., and Thakur, M.
Efficacy of pure and mixed inocula of *Colletotrichum falcatum* Went. *Indian Sugarcane J.*, 1965, **9**: 123-4.

Pure strains were found to be significantly more virulent and are recommended for testing sugar cane varieties for resistance to red rot.

9003. Pappelis, A. J., and Katsanos, R. A.
An approach to the study of the physiology of senescence and parasitism in sugarcane. *Phytopathology*, 1965, **55**: 620-2, bibl. 12.

A pith condition rating system, based on the distribution of dead, white parenchyma cells in the stalk, has been devised for sugar cane. Death rate of cells in parenchyma tissue differs in various internodes, and thus the study of senescence and parasitism might best be conducted using 2 or more internode positions in a single variety. Areas of dead cells in leaves and stalks correlated well with areas susceptible to *Physalospora tucumanensis*, suggesting that living cells are in some way involved in resistance to spread of the red rot pathogen. Fresh and dry weights in g./c.c. of tissue were found to vary greatly in the 15 internodes of the 2 varieties studied. It is suggested that the volume basis be used for comparative studies of stalk components rather than expressing data as percentages of fresh or dry weights of stalk tissue. [Authors' abstract.]—Southern Ill. Univ., Carbondale.

9004. Pappelis, A. J., and Katsanos, R. A.
Spread of *Physalospora tucumanensis* in stalk tissue of sugarcane. *Phytopathology*, 1965, **55**: 807-8, bibl. 4.

Hyphae of *Physalospora tucumanensis*, observed in inoculated sugar cane plants, were studied in relation to the area of discoloration and dead cells. The mycelium was always observed in areas of dead, air-filled, white cells, but not in areas of living cells in the discoloured areas. It was concluded that the pathogen was restricted in its spread through the stalk tissue by living parenchyma cells. It was apparently able to spread through the stalk tissue by means of vascular tissue.—Southern Ill. Univ., Carbondale.

9005. Hsu, S. C.
A root rot of sugarcane caused by *Pythium catenulatum* in Taiwan. *Phytopathology*, 1965, **55**: 705-6, bibl. 9.

Pathogenicity tests showed that infection with *Pythium catenulatum* caused 78 and 68% reductions in the dry weight of root and the above-ground portion, respectively.—Taiwan Sugar Exp. Stat.

9006. Siddiqi, Z. A.
Estimate of losses from sugarcane pests in Bihar. *Indian Sugarcane J.*, 1965, **9**: 105-7, bibl. 10.

Financial losses caused to millers and growers by sugar cane pests, principally borers, have been estimated. The average annual loss in cane yield for the state during the period 1959-62 was 7·12% and the annual loss in sugar recovery 0·38%.—Sugarcane Res. Inst., Pusa, Bihar.

9007. Saxena, A. P., and Dayal, R.
Efficiency of Cuban fly (*Lixophaga diatraeae* Tns.) against sugarcane borers. *Indian Sugar*, 1965, **15**: 83-6, bibl. 2.

The life history of the parasite is described. In the laboratory the percentages of parasitization of larvae of *Chilotraea auricilia*, *C. infuscatella*, *Scirpophaga nivella*, *C. partellus*, *Raphimetopus ablutella* and *Sesamia inferens* were 66·4, 18·9, 64·5, 3·3, 2·8 and 66·6, respectively. *Emmalocera depressella* and *Proceras indicus* were not parasitized. Fully grown larvae were preferred by the parasite. It cannot parasitize the top borer (*S. nivella*) under natural conditions, but the stalk borer (*C. auricilia*) may be parasitized. [From authors' summary.]—Sugarcane Res. Stat., Shahjahanpur.

9008. Kalra, A. N., Chaudhary, J. P., and Srivastava, R. C.
Migration of larvae of the sugarcane stalk borer, *Chilotraea auricilia* Ddgn. to the stubbles during April-May and in winter months. *Indian Sugarcane J.*, 1965, **9**: 125-6, bibl. 1.

In a study of larval migration during April-May, 1963, it was observed that the borer population in the aerial parts of infested shoots declined as the temperature increased and the R.H. decreased, whereas the population in the underground portions of the plants rose. The trend was reversed in early June as maximum temperatures fell slightly and R.H. increased. Up to 15% of the below-ground portions examined in Jan.-Feb. were found to contain over-wintering *C. auricilia* caterpillars. Estimated larval and pupal populations were in the range 1,500–10,000/ha.

9009. Kalra, A. N., and Sidhu, A. S.
Studies on biology of sugarcane top borer, *Scirpophaga nivella* Fabr. in the Punjab. *Indian Sugar*, 1965, **15**: 37-43, bibl. 10.

Studies conducted during 1952-6 revealed that the pest remains active from about mid-February to the end of October and passes through 4 complete broods and a partial 5th brood in a year. The life cycle is the shortest (33 to 44 days) in the case of the 3rd brood which appears at the beginning of July, probably because of favourable conditions of temperature and humidity at this time. Attack by this brood causes the maximum loss (80 to 83·5%) in weight of cane as compared to the healthy cane. There is considerable deterioration in juice quality also as a result of this attack. Losses caused by the 4th brood which appears during August-September are comparatively low. It was observed that top borer attack induced increased tillering in the initial stage of crop growth. [From authors' summary. See also *H.A.*, 35: 2251, 2252.]—Indian Inst. Sugarcane Res., Lucknow, and Sugarcane Res Stat., Jullundur.

9010. David, H.
Occurrence of two entomophagous fungi on sugarcane pests in Tanjore area of Madras State. *Curr. Sci.*, 1964, **33**: 349, bibl. 3.

Aspergillus parasiticus and *A. flavus* were recorded on the pink mealy bug, *Saccharicoccus sacchari*, and on the internode borer, *Proceras indicus*, respectively.—Indian Inst. Sugarcane Res., Koothanallur, Tanjore.

9011. Metcalfe, J. R.
Nitrogen status of sugar-cane leaves and the fecundity of a hemipterous pest. *Nature*, 1965, **207**: 219-20, bibl. 4.

In glasshouse experiments a very significant relationship was found between the N status of the cane leaf and the fecundity of *Saccharosydne saccharivora*. An increase of N from 1·5 to 2·5% of dry matter resulted in an increase in fecundity of over 100%.

9012. Veiga, F. de M.
A cigarrinha dos canaviais. **(The sugar cane froghopper.)** *Brasil Açúcar*., 1964, **64**(6): 9-16, from *Trop. Abstr*., 1965, **20**, Abstr. n1605.

BHC, aldrin, carbaryl or systemic insecticides gave control of *Tomaspis liturata* on the roots, and of *T. indentata* and *Mahanarva indicata* on the aerial parts of sugar cane.

Sugar cane—physiology, flowering and sugar formation.

9013. Mathur, P. S., and Saxena, P. K.
A note on the effect of gibberellic acid on cell size and internode length in sugarcane. *Indian Sugar*, 1965, **15**: 19-26, bibl. 6, illus.

In pot trials 5-month-old plants of the variety Co.S.510 were treated with minute quantities of a 1,000 p.p.m. aqueous solution and a 10,000 p.p.m. lanolin paste of GA. Various types of cell were measured. It was observed that leaf and stem cells from treated plants were linearly elongated and of decreased width. The treatments also caused elongation of the 6th to 11th internodes, accompanied by a decrease in their circumference; this effect gradually disappeared until internode elongation was less than in the control canes.—Sugarcane Res. Stat., Shahjahanpur.

9014. Coleman, R. E.
Effects of intercalated noninductive nights on floral initiation in sugarcane. *Phyton, Argentina*, 1965, **22**: 15-18, bibl. 13.

Earlier work with short-day plants other than sugar cane showed that long days intercalated in a series of inductive short days were inhibitory to flowering. The present experiment demonstrated that intercalation of non-inductive nights (light interrupted) in a series of inductive (natural) nights reduces flowering of a short-day clone (H.37-1933). In this case the light-interrupted night was in itself an inhibitory factor since the length of the day was not a variable, and the inhibition could be merely a matter of non-production of stimulus for that individual night. It appears that the stimulus produced by separated inductive nights is additive and that the degree of floral induction is related to the absolute number of inductive nights during the induction period. [Author's abstract. See also *H.A.*, 34: 5940 and 35: 4740.]—U.S. Dep. Agric., Honolulu.

9015. (Coleman, R. E.)
Sugarcane flowering. *Agric. Res., Wash.*, 1965, **13**(10): 13.

Floral initiation in Hawaii is normally complete by 25 September, day-length perception having taken place from 1–20 September. It was significantly reduced by removing the leaf spindle on 15, 22 or 29 August, but removal after 5 September had no effect. Spindle removal during August and up to 19 September, however, reduced the percentage of completely developed flowers; leaf trimming up to 5 September had the opposite effect. The leaf spindle was considered most essential to floral initiation about 22 August, and the leaves most essential on 12 September.

9016. Kortschak, H. P., Hartt, C. E., and Burr, G. O.
Carbon dioxide fixation in sugarcane leaves. *Plant Physiol.*, 1965, **40**: 209-13, bibl. 15.

The first stable compounds formed in photosynthesis were malic and aspartic acids. These acids were converted to sucrose via 3-phosphoglyceric acid and hexose phosphates. [From authors' summary.]—Hawaii Sugar Plant. Ass. Exp. Stat., Honolulu.

9017. Alexander, A. G.
Changes in leaf-sugar content and enzyme activity of immature sugarcane following foliar application of indole-3-acetic acid, 2,4-dichlorophenoxyacetic acid, and maleic hydrazide. [Spanish summary 1¼ pp.] *J. Agric. Univ. P.R.*, 1965, **49**: 1-34, bibl. 27.

The compounds were applied to 10-week-old plants. Leaf samples were assayed 1, 3, 9 and 27 days after treatment. The following results were obtained: Highest sucrose levels were recorded 9 days after treatment among the IAA and 2,4-D groups. Maleic hydrazide had little effect on sucrose content. Fructose content was highest at 9 days and declined sharply thereafter, indicating that fructose metabolism was a factor of primary importance. No relationship was evident between sucrose and reducing-sugar levels. Glucose-oxidase activity was relatively high at the period of greatest sucrose production, suggesting a possible suppression of glycolysis by this system. IAA generally stimulated enzyme activity while MH suppressed the enzymes or had no effect at all; 2,4-D effects were less pronounced. Enzyme stimulation or inhibition usually occurred within 1 day of treatment, though in several instances such effects were not recorded until 9 or 27 days. High sucrose production at 9 days was accompanied by a pronounced decline of glucose-6-phosphatase, and to a lesser degree a decline of β-glycerophosphatase. The importance of retarded phosphatases in sucrose production is discussed. IAA caused striking increases in amylase, hexokinase and transaminase activity within 1 day following treatment. This indicates that starch may have served as a source of glucose to be metabolized as a part of the IAA growth-promoting action. The general stimulation of acid phosphatases by IAA appeared to eliminate this material as an agent for long-term sucrose promotion. MH exhibited more suitable properties for this role by either retarding acid phosphatases or not affecting them at all. Peroxidase was greatly stimulated by IAA, but the enzyme declined markedly when sucrose production was high. The inverse relationship of peroxidase with sucrose agrees with earlier observations of the same response. The stimulating and inhibiting effects of the growth regulators upon enzymes are discussed on the basis of competitive and non-competitive inhibition, and from the standpoint of altered activation energy level. [From author's summary and conclusions.]

9018. Alexander, A. G.
Induction of varying sugar levels in leaves of immature sugarcane by use of acid phosphatase inhibitors. [Spanish summary 1¼ pp.] *J. Agric. Univ. P.R.*, 1965, **49**: 35-59, bibl. 25.

Molybdenum at 2, 20 and 200 p.p.m. and fluorine at 1, 10 and 100 p.p.m. were applied as foliar sprays to 14-week-old sand-cultured plants. A second group of plants was supplied with 0, 0·01 and 1 p.p.m. Mo and 1, 3 and 9 meq./litre Ca as nutrient variables and harvested at 9 weeks. Inconsistent but significant sugar and enzyme variations were noted. Phosphatase inhibition was usually accompanied by increased sucrose. Twenty p.p.m. Mo caused the most consistent responses. Mo as a nutrient at 0·01 p.p.m. activated the acid phosphatases. At 1 p.p.m. it had an inhibiting effect accompanied by increased sucrose, provided that Ca was supplied at the lowest level. Higher Ca levels reduced or eliminated the inhibiting effect of Mo on phosphatases.

9019. Alexander, A. G.
Physiological studies of enzymes catalyzing the synthesis and hydrolysis of sucrose, starch, and phosphorylated hexose in sugarcane. [Spanish summary 1 p.] *J. Agric. Univ. P.R.*, 1965, **49**: 60-75, bibl. 15.

Four-month-old plants were subjected to low levels of nitrate, potassium and water in sand culture to induce variable sugar levels. Leaf samples were frozen for enzyme assay 7 or 14 days following treatment. A slight but generally consistent increase of sucrose was obtained by each of the 3 treatments. Sucrose phosphorylase and invertase were unaffected by any of the treatments. Phosphatases and amylase were generally suppressed by every treatment. Both the high and low extremes of sucrose content were followed, after 7 or 14 days, by starch-phosphorylase changes which were inversely related to the sucrose levels. Periods of high amylase activity were accompanied, or followed closely, by concurrently high starch-phosphorylase activity. No starch was detected in either leaf or sheath extracts. The role of amylase in cane is discussed in detail, particularly as a means of preventing the loss of glucose from pathways of active metabolism, or from sucrose formation. Hexokinase varied independently of the sucrose level. The enzyme was particularly active among low-K plants at periods when glucose was abnormally high. [From author's summary.]

Sugar cane—harvesting, quality and storage.

9020. Pembroke, E. A.
A method of handling lodged cane. *Cane Grs' quart. Bull.*, 1965, **28**: 114-15, illus.

A locally designed harvesting machine, equipped with guides and lifting arms and 2 opposed shear blades for ground cutting, saved time and labour in harvesting storm-damaged cane.

9021. Rao, K. K. P., and Rao, B. S. L. N.
Preliminary studies on effects of pre-harvest burning of sugarcane on cane weight and juice quality. *Indian Sugarcane J.*, 1965, **9**: 77-85, bibl. 14.

Weight and quality changes were compared in burnt and green cane which was either left standing or topped immediately after harvest and stored for up to 3 days in the shade. The varieties Co.419 and Co.527 were used. Stored green cane lost weight more rapidly and exhibited a significant reduction in juice quality compared with stored burnt cane. The juice quality of burnt standing cane deteriorated rapidly in both varieties unless harvested within 24 hours of burning. The percentage drop of sucrose was greater in Co.527 than in Co.419, both as stored green and standing burnt cane. There was a significant increase in the moisture content of standing burnt cane stalks after 72 hours, the deterioration being due more to the effect of burning than to lodging.—Sugarcane Liaison Fm, Tanuku, A.P.

9022. Grant, R.
Quality control at Central Monserrate. [English and Spanish.] *Sugar y Azúcar*, 1965, **60**(4): 125-8, 200, 202, 208, bibl. 14.

Details are given of the preliminary results of a programme to improve the quality of the raw cane delivered to the factory. Data are included on the ratios of brix to yield and brix to cane ripeness.

9023. Shoji, K., and Samuels, G.
A study of declining sucrose yields in Puerto Rico. [English and Spanish.] *Sugar y Azúcar*, 1965, **60**(4): 121-5; 176-8, 229, bibl. 10.

See *H.A.*, 35: 6770.

9024. Sastry, A. S., and Ghosh, A. K.
An assessment of conditions of storage of *gur* in certain trade godowns. *Indian Sugarcane J.*, 1965, **9**: 114-20, bibl. 6.

The effects of initial composition, temperature, R.H., smoke treatment and storage in cotton seed were studied. High humidity was the chief factor contributing to gur deterioration. Good quality gur was more resistant than poorer quality to liquefaction and weight loss. [See also *H.A.*, 35: 2268.]

Tea.

9025. Kats, K.
Some achievements in the cultivation and production of tea in the USSR. [French and Spanish summaries ½ p. each.] *World Crops*, 1965, **17**(2): 57-61, illus.

A brief report is given of the selection and propagation of hybrid varieties. The mechanization of harvesting and processing in the U.S.S.R. is also described.

9026. Tomo, N., Watanabe, A., and Mitsui, M.
Studies on the utility of Assam varieties in tea plant breeding. [Japanese, with English summary ½ p.] *Study of Tea*, 1965, No. 30, pp. 5-14, bibl. 3.

Studies on the growth, leaf and bud characters and first crop yield of F_1 progeny.

9027. Toyao, T.
Correlation and genetical analyses of several characteristics at the stage of individual selection in the tea plant. Part 2. On the correlations among yield, number of leaves per plant and characters of the leaf in clonal varieties for green tea. [Japanese, with English summary ½ p.] *Study of Tea*, 1965, No. 30, pp. 1-4, bibl. 6.

Correlation coefficients were calculated between the number of leaves per plant, leaf length, variability of leaf length, leaf width and variability of leaf width in 9 clonal genotypes. In general, heritabilities on a single plant basis were high for leaf number, width and length, and very low for variabilities of length and width. The latter, however, were relatively high on a mean value basis. The coefficient of variation was large only for the number of leaves. Large number of leaves was associated significantly with large leaf size, and s
number with small size. The relationships betw
yield and the 5 characters studied were expresse
single, partial and multiple correlations, and indic
that the relative yielding capacities of clones grown u
similar conditions could be determined by the nu
of leaves. [For part 1 see *H.A.*, 35: 4758.]

9028. Bahtadze, K. E.
**The principles of varietal seed production in
cultivation of tea.** [Russian.] *Agrobiolo*
1965, No. 2, pp. 174-83, illus.

Productivity, biochemistry, winter hardiness and
production in new Georgian tea varieties.

9029. Green, M. J.
Seed management. 2. Despatch and nurse
Tea, 1965, **6**(1): 11-14.

Advice on packing and despatch by the seed produ
and testing, pre-germination and planting by the gro
[For part 1 see *H.A.*, 35: 6816.]

9030. Sanai, H., Amma, S., and Matsushita, S.
**Studies on tea cuttings. The promoting effe
root formation of the etiolation method.** [Japan
with English summary 1 p.] *Bull. Tea Res.*
Shizuoka, 1965, No. 2, pp. 235-76, bibl. 43.

Young shoots with 2–3 leaves and a bud were co
in late April with black vinyl placed 30–40 cm.
the bush, and exposed to sunlight again after abo
weeks. The cuttings were dipped in 0·02% NAA
24 hours. Rooting was excellent, fully grown nu
plants being obtained after 11 months. W
fertilizers and gibberellin were applied, the nu
period was shortened and the plants reached a he
of 27 cm. after 7 months.

9031. Price, R. U.
**Bringing vegetatively propagated tea into pro
tion: observations in the low-country.** *Tea Qu*
1965, **36**: 33.

Practical details of an establishment method w
allows the root system to develop fully before cropp

9032. Kawai, S.
Studies on the tea soil in our country. [Japan
with English summary 4 pp.] *Bull. Tea*
Stat. Shizuoka, 1965, No. 2, pp. 1-233, bibl. 1
illus.

In an extensive study of physical and chemical prop
ties it was observed that soils of comparatively
acidity and high exchangeable base content w
associated with higher tea yields. In a pot trial inve
gating the relationship between tea growth and
composition of exchangeable bases in the soil, the
growth was obtained in soils containing 25% saturat
of exchangeable Ca, 10% K and 5% Mg, and in s
with 30–50% exchangeable Ca+Mg and 10% K.

9033. Kawai, S., and Takayanagi, H.
On the tea soils of the Miwa district, Shizuoka-
[Japanese, with English abstract ⅔ p.] *Study*
Tea, 1965, No. 30, pp. 66-76, bibl. 6.

A survey of physical and chemical properties.

9034. Tomo, N., Watanabe, A., and Mitsui, M.
**The relationship between the soil moisture cont
and cold resistance of the tea plant.** [Japane
with English summary ½ p.] *Study of Tea*, 19
No. 30, pp. 23-30, bibl. 5.

In pot trials using wet and dry soil it was found that
refractive indices of leaf juices increased with decreas

emperature, and that the increase was greater in
ts grown on dry soil. The increase was checked by
tening the soil. Plants grown in wet soil had to be
sed to lower temperatures than those in dry soil to
ve the same degree of hardiness. No differences
ld injury were observed between plants in wet and
soil, either in the greenhouse or in the field, but
ts in wet soil showed less cold resistance in an
cial freezing test. A reduction in cold resistance
observed in the coldest season when the soil water
ent was increased. Buds sprouted later on plants
y soil and the first crop yield was smaller.

. HASSELO, H. N., AND SANDANAM, S.
Chemical weed control in tea. *Tea Quart.*, 1965, **36**: 22-32, bibl. 9, illus.

following herbicides were assessed at various rates
plication to soil and foliage, and are arranged in
nding order of efficiency for weed control with mild
otoxicity: prometryne, simazine, Karmex, atratone,
pon, atrazine, DH-34, Gramoxone, Phordene and
oxylene Plus. The relationship between soil
on and chemical weed control is considered.

. WILLSON, K. C.
The selection of herbicides for use in tea plantations. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 12.

f 38 herbicides screened for selectivity to 3-year-old
ing tea the following have produced, at the most,
mildly toxic symptoms after 2–3 applications at
nth intervals: (1) simazine and trifluralin at
8 lb., chloramben at 0·48–3·84 lb. and diphenamid
8–12·8 lb./acre as soil treatments or foliar sprays;
nac at 0·25–6 lb., cycluron at 0·5–6 lb., linuron at
10 lb. and neburon at 1–8 lb./acre as soil treatments
he lower of these rates as foliar sprays; (3) atraton
25–4 lb./acre as a soil treatment; (4) simazine at
7·2 lb. plus amitrole at 0·3–2·4 lb. and dalapon at
11·2 lb./acre as soil treatments and the lower rates
liar sprays; (5) atrazine at 0·5 lb. (at 1-year intervals)
diuron at 2·4 lb./acre as soil treatments. Herbi-
showing promise after a single application and
rejected outright are listed. Herbicides in the first
p were further evaluated against natural infesta-
composed mainly of broad-leaved weeds. Low
of diuron and of simazine plus amitrole were the
successful in plots not hand-weeded prior to
cation. In a trial laid down in mature tea in 1962
was no significant difference in the broad-leaved
control provided by simazine at 4 lb. plus paraquat
4 lb., diuron at 1·6 lb. and atraton and fenac at
./acre. In the absence of prior spraying with
on or hand-weeding, simazine plus paraquat and
n gave significantly better grass control. Prelimi-
observations of trials laid down in 3-year-old tea in
, 1964, showed that simazine, atraton and diuron
only effective if used in conjunction with a herbi-
ossessing contact activity.—Tea Res. Inst. E. Afr.,
ho, Kenya.—From *Weed Abstr.*, **14**, No. 114.

. TWIGA CHEMICAL INDUSTRIES LTD.
Soil-acting herbicides in tea. [Pap. read at] *3rd E. Afr. Conf. on Soil-acting Herbicides, Nairobi, 1964*, pp. 2.

ex (diuron 80%) at 2–5 lb./acre [commercial
uct?] has given good control of broad-leaved weeds
nnual grasses in all the major tea-growing areas of
a. In trials in the Kericho district, where rain
on after applying Karmex at 2·5 lb./acre 3 weeks
after pruning and while the trash was still present, control lasted 1 year, the only additional operations needed being hoeing and/or spot-treatment of resistant species. Treatments should be made to clean ground, with re-treatment at 2 lb./acre where necessary to maintain control until the tea has formed a canopy. Up to 5 lb./acre is not injurious to mature trees if applied as a soil-directed spray before bud-burst. Not more than 3 lb./acre (3–4 lb./acre on very alkaline soils) should be applied in tea less than 3 years old.—From *Weed Abstr.*, **14**, No. 113.

9038. BISWAS, P. K., AND HEMPHILL, D. D.
Role of growth regulators in the uptake and metabolism of *s*-triazine herbicide by tea leaves. *Nature*, 1965, **207**: 215-16, bibl. 4, illus.

When isolated leaves of the variety Nyasaland were floated on fluid agar gell containing C^{14}-labelled propazine for 24 hours, the upper surface absorbed only 3·5 p.p.m. of the herbicide whereas the lower surface absorbed 15 p.p.m. The addition of GA to the agar medium increased absorption by the lower surface but slightly decreased that by the upper surface; the addition of IAA increased absorption of propazine by both surfaces. The amount of propazine which diffused through isolated cuticles of the upper and lower leaf surfaces, with and without growth regulators, was more or less the same. With both growth substances a slight decrease in diffusion was obtained. Propazine, although absorbed in large quantities by tea leaves, was not translocated basipetally. Propazine appeared to be easily metabolized by tea plants, giving at least 2 metabolites.—Tuskegee Inst., Ala, and Univ. Mo, Colombia.

9039. FOSTER-BARHAM, C. B.
Application of NPK fertilizer mixtures to mature tea in Ceylon—a historical review. *Trop. Agriculturist*, 1963, **119**: 135-44, bibl. 8, [received 1965].

This review includes a note on a trial in progress involving the application of 150, 300 and 450 lb. N, 100, 200 and 300 lb. potash and 0, 48 and 96 lb. MgO per acre per 2 years at different frequencies of application. In the first and second years 450 lb. N given in 9 applications yielded 2,280 lb. and 4,987 lb. of made tea, respectively, compared with 1,870 lb. and 4,259 lb. of made tea when 150 lb. N in 5 applications was used. No significant responses to potash or Mg were observed.

9040. GIORGADZE, E. JU.
The effect of intensive nutrition on manganese accumulation in tea leaves and on the quality of [manufactured] produce. [Russian, with English summary.] *Subtrop. Kul'tury*, 1963, No. 1, pp. 39-44, from *Ref. Ž.* (*55. Rasten.*), 1964, Abstr. 10.55.346.

The application of PK increased the Mn content of tea leaves and of the partially prepared product at the beginning of the season by 16–16·2 mg. [per 100 g.] and at the end of the season by 16 mg. compared with the controls. The application of N at 300 and 500 kg./ha., in addition to PK, increased the Mn content by 16 and 32 mg., respectively. A further increase of the N rate to 700 kg./ha. was not accompanied by a further increase in the Mn content. Irrigating the plantation, which had received PK+300 kg. N+FYM+liquid manure, increased the Mn content in tea samples in the same way as treatment with a single level of N. The highest Mn content in tea leaves (78 mg./100 g. fixed leaf or partially prepared product) was obtained with increased rates of organo-mineral fertilizers plus green manure as a mulch.

9041. Kasai, K., and others.
Factors affecting the occurrence of die-back and canker disease of tea. [Japanese, with English summary ½ p.] *Study of Tea*, 1965, No. 30, pp. 39-58, bibl. 22.

Surveys were carried out in over 20 gardens in 1960-62. The most severely affected were characterized by poor drainage, plucking of immature plants and severe infections of *Exobasidium reticulatum* blight and brown blight (*Guignardia camelliae*). No die-back and canker infection was seen in plants under 5 years old; the most badly infected were over 10 years old and had poor or superficial root systems. The appearance of the disease was associated with bad weather conditions in 1953-1955. Chemical analysis of leaves indicated that in severely infected tea gardens P and K supplies were poor and N in ample supply.

9042. Shanmuganathan, N.
Collar and branch canker in young tea caused by *Phomopsis theae* Petch. *Tea Quart.*, 1965, **36**: 14-21, bibl. 14, illus.

Collar and branch canker of tea, earlier attributed to *Leptothyrium theae*, is now shown to be caused by *P. theae*. In Ceylon the disease occurs at high elevations. Canker attacks are sporadic, and vary in intensity from year to year and between localities. The disease is serious only in young plantations up to 8 years of age. There is marked variation in clonal susceptibility. Drought and poor soil conditions appear to be predisposing factors. Canker infections were found to be associated with wounds on the collar and frame, and with the nodes on young branches. Inoculation experiments showed that, of the fungi commonly associated with stem canker in tea, namely *P. theae*, *L. theae*, *Macrophoma theicola* and *Botryodiplodia theobromae*, *P. theae* is the most pathogenic in the high country. The observations are discussed in relation to tentative control measures. [From author's summary.]

9043. Hirokawa, S.
On the causal fungus of the leaf spot disease of tea. [Japanese, with English summary ½ p.] *Study of Tea*, 1965, No. 30, pp. 31-8, bibl. 13, illus.

Experimental evidence suggests that *Sphaceloma theae* (the cause of scab disease) is also the cause of leaf spot. *Phyllosticta theaefolia*, hitherto thought to be the cause of leaf spot, was also present.

9044. Banerjee, B.
Mites of tea and ancillary crops. *Two and a Bud*, 1965, **12**(1): 4-7, bibl. 6.

Tables show types of mite damage, mite distribution on the plant, life cycles and the occurrence of 13 species of mites on tea and 3 associated plants. The effects of certain acaricides on mixed mite populations are briefly discussed.

9045. Sharma, P. C.
A note on the control of *Sternocera aurosignata* (buprestid root borer). *Two and a Bud*, 1965, **12**(1): 3.

Limited control of existing infestation may be obtained by applying Telodrin 15 e.c., 1 in 500, to the soil around the collar. Preventive measures include the hand collection of adult beetles and eggs from June to O ber, pre-treatment of nurseries with Telodrin spra 15 l./ha. and the application of Telodrin 1 in 500 to soil at the time of planting out.

9046. Nakayama, A., and Sanai, H.
Morphological study on the growth of tea b Part 2. Differentiation and developmental pro of axillary buds in summer. [Japanese, English summary ¼ p.] *Study of Tea*, 1965, 30, pp. 15-22, bibl. 6, illus.

The axillary buds of summer shoots contained 4 im ture leaves (including leaf primordia) at diffe developmental stages. As soon as the shoots pruned, the new leaf primordia differentiated in remaining axillary buds. These axillary buds flus about 20 days after pruning. The primordia of axillary buds emerged in the axils of the imma leaves. The relations between the developme ability of new shoots and the growing position axillary buds were investigated. It was concluded the immature leaves in axillary buds lose viability if rest for a long period. [From authors' summ For part 1 see *H.A.*, 31: 7225.]

9047. Sanderson, G. W., and Perera, B. P. M
Carbohydrates in tea plants. 1. The carbohyd of tea shoot tips. *Tea Quart.*, 1965, **36**: 6 bibl. 13, illus.

The results of analysis indicated that the prin soluble carbohydrates were glucose, fructose sucrose. Traces of raffinose and an unidentified s were observed. The insoluble carbohydrates v pectin, crude fibre and an unidentified polysaccha which was not starch but acted as a reserve sourc sugars. Marked changes in carbohydrate levels t place during manufacture, beginning immediately a plucking. Seasonal variations were also obser The changes in non-withering flush (stored in polyt bags) were different from those which occurred whe flush was allowed to wither.

9048. Sanderson, G. W., and Selvendran, R.
The organic acids in tea plants. A study of non-volatile organic acids separated on silica *J. Sci. Food Agric.*, 1965, **16**: 251-8, bibl. 37

Succinic, oxalic, malic, citric, isocitric and 5 unkn acids were found at appreciable levels (more than μ equiv./g. fresh wt.) in tea shoot tips. The major a quantitatively, were oxalic, malic and citric acids. acids studied were recovered quantitatively from p extracts, but they accounted for less than one-fourt total acidity present in tea shoot tips. The acid le in shoot tips varied quantitatively between clones between sampling dates, and also both quantitati and qualitatively between different parts of the tea p [From authors' abstract.]—Tea Res. Inst. Cey Talawakelle.

9049. Lin, C.-F.
Rapid analyses of tea leaves for ten elements the technique involved in the preparation p [Chinese, with English summary 1½ pp. *agric. Ass. China*, 1965, No. 49, pp. 32-47, bibl

Methods of estimating the N, P, K, Ca, Mg, B, Cu Mn and Zn contents of tea leaves were tested and data as affected by wet and dry ashing compa Sources of error during the preparation and storag samples were also studied.

WILLIAMS, H. A.
Occurrence of lead in tea. *J. Ass. publ. Anal.*, 1964, **2**(1): 8-12, from *Analyt. Abstr.*, 1965, **12**, Abstr. 3034.

tine method of determination used on the dried

Sundry crops.

VAN DOESBURG, P. H.
Two insect pests of soursop in Surinam. [English, French and Spanish.] *Carib. Agric.*, 1964, **3**: 797-811, illus., from *Trop. Abstr.*, 1965, **20**, Abstr. n1555.

ly bagging the fruit with mosquito netting when 1 in. in diam. gave protection against the moth *nota anonella* and the wasp *Bephrata maculicollis*.

PORTÈRES, R.
Le palmier Ronier (*Borassus aethiopum* Mart.) dans la province du Baoulé (Côte d'Ivoire). **(*Borassus aethiopum* in Baoulé, Ivory Coast.)** *J. Agric. trop. Bot. appl.*, 1964, **11**: 499-514, illus.

count of the various uses of the palm and details al methods of tapping for palm wine.

MAYMONE, B., BATTAGLINI, A., AND TIBERIO, M.
I mannani dei semi della palma dum (*Hyphaene* spp.) nell'alimentazione animale. **(Mannans of doum palm (*Hyphaene* spp.) seeds in animal nutrition.)** [English summary 1½ pp.] *Ann. Sper. agrar.*, 1962 (issued 1965), **16**: 275-301, bibl. 9, illus.

n palm kernels no longer in demand for button facture present a promising source of animal g stuff.

9054. MUTHUSWAMY, S., AND RAMU, N.
A note on air-layering in West Indian cherry (*Malpighia punicifolia* L.). *S. Indian Hort.*, 1964, **12**: 68-9, bibl. 3.

Air-layered shoots, treated with Seradix-B before covering with moss and polythene film, produced roots within 1 month. No roots formed on the untreated controls. The treated layers were ready for separation after 65–75 days and flowered in 10 months in the field compared with 20 months required by seedlings.—Agric. Coll. and Res. Inst., Coimbatore.

9055. GÓMEZ, C., AND OTHERS.
Investigación de los amino ácidos de las proteínas y amino ácidos libres del jugo de naranjilla por cromatografía en papel. **(Paper-chromatographic investigation of the amino acids of the proteins and the free amino acids of the sap of the naranjilla.)** *Cienc. Nat.*, 1964, **7**: 74-9, bibl. 4, illus.

The sap of *Solanum quitoense* contained alanine, aspartic acid, glutamic acid, glycine, histidine, hydroxyproline, isoleucine, leucine, lisine, methionine, serine, valine and two unknown amino acids. The proteins contained the above-named amino acids and arginine, cistine, proline and trianine.

9056. SINGH, H., SESHADRI, T. R., AND SUBRAMANIAN, G. B. V.
Chemical investigation of lac hosts. I. *Zizyphus jujuba* and *Z. xylophora*. *Curr. Sci.*, 1965, **34**: 344-5, bibl. 5.

Studies on the bark and wood, mainly of *Z. jujuba*.